

ELECTRICAL CONSTRUCTION AND MAINTENANCE

FEBRUARY • 1957

PRICE 35 CENTS

WITH ELECTRICAL CONTRACTING

The All-Electric School is here — now

A cost analysis of Park-
side School's first year of operation.

page 80

ELECTRICAL DISTRIBUTION

system in a Texas manufacturing plant
uses four voltage levels.

page 69

DAYLIGHT INDOORS

— a test installation provides comfort-
able office lighting at 450 fc.

page 76

A MCGRAW-HILL PUBLICATION

56 TH YEAR

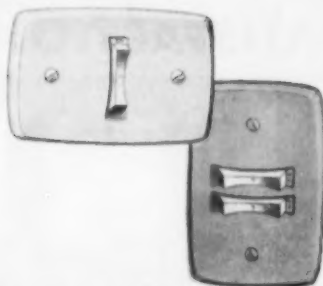


He's reaching for...
the **BEST**
ELECTRICAL
TAPE...

ACCURATE TAPE

FRICITION, RUBBER SPLICING,
and PLASTIC TAPES
LARGEST EXCLUSIVE MANUFACTURER OF ELECTRICAL TAPE

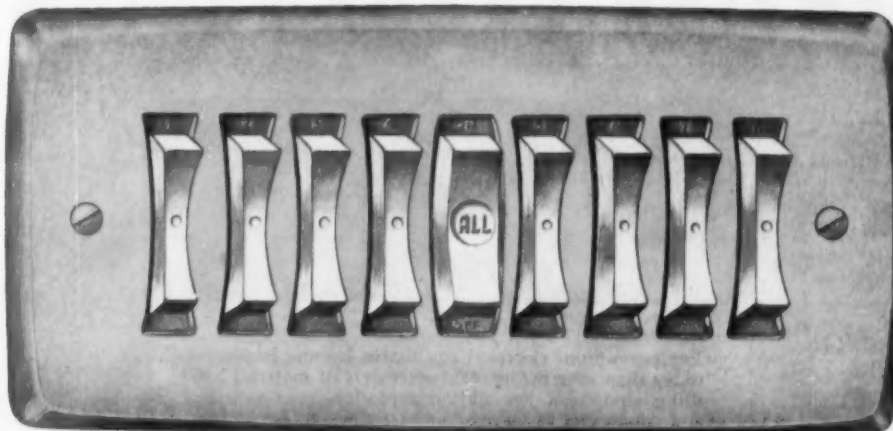
ACCURATE MANUFACTURING COMPANY
Garfield, New Jersey



switches your customers want

And no wonder. They're not just remote-control switches, not just low-voltage switches. They're Remcon's dramatic new, Hi-Fashion Switches. Show them to your builder-customers now—and start raking in extra Remcon profit on every wiring job.

REMCON the easiest switch to install... is now the most beautiful switch of all!



*master control
with one-hand
operation*

You can control lights in 8 rooms individually or all 8 simultaneously with one switch. Definite on-off positions. Completely fool-proof operation. Color-coded for instant identification of each switch.

*complete line
of matching
switchplates*

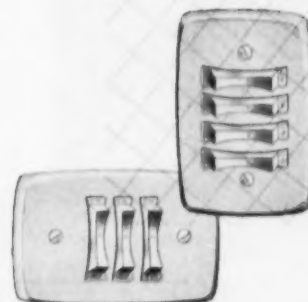
for 1, 2, 3, and 4 switches. Choice of buff or transparent with gold insert . . . the insert can also be used as a template to cut out matching wallpaper or can be painted to match the wall. All switches glow in the dark.

*exciting
fashion-wise
design*

The look of tomorrow on the most modern switch of today. No other switch offers you the handsome contours of the REMCON plate, sweeping down towards the switches . . . or the fashion-engineered "butterfly" design of the REMCON switches themselves. No other switch adds such a gracious note to any decor.

*famous, easy,
remcon
low-voltage
installation*

REMCON is the only low-voltage system with a transformer built right into the relay. It's the new, modern, simplified wiring method. Now, you have an irresistible combination for your customers—low voltage, remote-control switching with the look of tomorrow—at little more than the cost of ordinary switching!



ask your jobber to show you

REMCON[®] HI-FASHION SWITCHES

Pyramid Instrument Corporation, Lynbrook, N.Y. makers of the world-famous AMPROBE snap-around volt-ammeter.

FOR COMPLETE SATISFACTION AND SAFETY

APPLETON

INDUSTRY'S MOST ADVANCED LINE

EXPLOSION-PROOF EQUIPMENT



JUNCTION
UNILETS

LIGHTING
FIXTURES



RECEPTACLES



SWITCHES

Explosion-proof electrical equipment is more important today than ever before. Manufacturers of material handling equipment are adding explosion-proof switches and connectors to be used in hazardous areas. And, an ever increasing number of industrial plants are almost entirely equipped with explosion-proof electrical equipment. Appleton's full line of explosion-proof electrical equipment is the result of extensive laboratory development and field tests, with your individual safety requirements in mind. Proven acceptance and use by leading companies the world over is your assurance that APPLETON is...

TODAY, MORE THAN EVER...

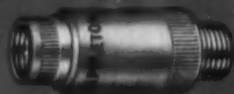
The Standard for Better Wiring®



LINE STARTER
UNILETS



FLEXIBLE COUPLINGS



EXPANSION UNIONS

CIRCUIT
BREAKER
UNILETS



Efficient, one-call "SERVICE BY WESCO" on these items



Industrial Lighting



Outlet
Boxes

Also Manufacturers of



"ST" Series
Connectors



Malleable Iron
Unilets & Covers



Automatic Recloser

APPLETON ELECTRIC COMPANY

1704 Wellington Avenue, Chicago 13, Illinois

ELECTRICAL CONSTRUCTION AND MAINTENANCE

with which is consolidated Electrical Contracting, The
Electrician and Electrical Record . . . Established 1901

Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

56th Year FEBRUARY • 1957

Sidelights	5
Washington Report	7
Modernization at 277/480, <i>An Editorial</i>	67
Power for a Texas Plant	69
By J. F. McPARTLAND—Indoor and outdoor electrical distribution—at four different voltage levels—is a firm base for the modern electrical system designed for a valve manufacturing plant in Stafford, Texas.	
Apartment Survey Shows Electrical Needs	75
Consolidated Edison asks New York apartment dwellers about electric kitchens, wiring and appliances.	
450 Footcandles Light an Office	76
By B. C. COOPER—Test installation of fluorescent lamps in Trofferall lighting system demonstrates that high lighting levels can be made comfortable, and that lighting results compare favorably with daylight outdoors.	
The All-Electric School	80
By R. L. BOYD—Success of the much-publicized electrically heated Parkside School in Hartford City, Ind., adds impetus to serious consideration of electric heat as a school-heating medium.	
Rewiring a Trailer Park	84
By JAMES FLYNN—How a special mounting for service transformers solved a big problem in the modernization of a growing trailer park in New Jersey.	
Maintenance for Automation	86
By R. L. KIRKPATRICK—Manufacturing plant operations are being done more and more by machines and automatic devices representing large investments in capital goods.	
Use Wiring Devices to Sell-Up Residential Wiring	88
Kansas City electrical contractor uses switch sales-kit to convince project builder that quality devices add "sales appeal" to his homes.	
Expansion for Better Service	90
The growth story of Illinois Electric Works at East St. Louis. Modernization involved a series of structural additions and acquisition of new equipment.	

MORE 

FEBRUARY • 1957 *continued*

Investment in Distribution—Part 1 93

A 2-part discussion designed to aid plant engineers, electrical contractors and consultants in determining power investments that will best serve specific conditions and purposes.

Design Data for Industrial Infrared Applications 98

By J. C. HOFFMAN—Calculations for estimating heating requirements for heating metal to predetermined temperatures, evaporating liquids, drying paints or other surface finishes.

Practical Methods 107

Lighting planned for flexibility; electric heat for milk houses; ramp garage calls for precision conduit work.

Motor Shops 121

Agitator washer cleans motor parts; rotating table for sand blast unit; in-line spray hood has dual-draft exhaust.

Reader Service 133

Product news announcements, catalogs and bulletins.

Reader's Quiz 169

Questions and answers on regulating voltage; improving power factor on induction motor; further discussion on generator short circuit.

Questions on the Code 177

Answers to code questions including underfloor raceway; loop wiring; bowling alley-public assembly; bonding at service equipment.

In the News 195

Dates Ahead 205

What's the Law? 206

By JACK and MICHAEL STRAUSS.

W. T. STUART, Editor

Alice McMullen, Associate Editor

Berlon C. Cooper, Eastern Editor

August Eckel, Middle West Editor

Hugh P. Scott, Industrial Editor

J. F. McPartland, Jr., Engineering Editor

W. J. Novak, Assistant Editor

L. E. Devendorf, Art Editor

**Ray Ashley, B. A. McDonald,
Glenn Rowell, B. Z. Segall,
Consulting Editors**

W. A. Cyr, Western Consultant

Dexter Keezer, Dir. Economic Staff

**George B. Bryant, Jr., Chief Correspondent,
Washington Bureau**

John Wilhelm, Editor, World News

W. W. GAREY, Publisher

C. B. Shaw, Advertising Sales Manager

District Managers

A. B. Conklin, New York

S. A. Jones, New York

E. P. Gardner, Philadelphia

F. J. Seiler, Cleveland

R. A. Hubley, Detroit

Charles F. Minor, Jr., Chicago

R. R. Ream, Chicago

T. H. Carmody, R. C. Alcorn, San Francisco

E. E. Schirmer, Los Angeles

R. H. Powell, Atlanta

**Member of
AUDIT BUREAU OF CIRCULATIONS and
ASSOCIATED BUSINESS PUBLICATIONS**

Vol. 56, No. 2

ELECTRICAL CONSTRUCTION and MAINTENANCE

February 1957

Published monthly with an additional issue in September by McGraw-Hill Publishing Company, Inc. James H. McGraw (1860-1948), Founder, Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Publication Office, 99-129 North Broadway, Albany 1, N. Y. Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice-President, and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Joseph H. Allen, Vice-President and Director of Advertising Sales; A. R. Venzian, Vice-President and Circulation Coordinator.

Subscriptions: Address correspondence to Electrical Construction and Maintenance—Subscription Service, 330 W. 42nd St., New York 36, N. Y. Allow one month for change of address.

Subscriptions are solicited only from persons engaged in electrical construction or electrical maintenance. Position and company connection must be indicated on subscription orders.

Single copies 35c. Electrical Products Guide \$2.50 to those in the electrical construction and maintenance industry. Subscription rates—United States and possessions, \$3.00 a year; \$4.00 for two years, Canada, \$5.00 a year; \$6.00 for two years. Other Western Hemisphere and Philippines, \$10.00 for one year; \$15.00 for two years. All other countries, \$15.00 a year. Three-year rates, accepted on renewals only, are double the one-year rate. Entered as second class matter August 29, 1938 at the Post Office at Albany, N. Y., under act of Mar. 3, 1879. Printed in U. S. A. © Copyright 1957 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved.

Sidelights

ALL-ELECTRIC SCHOOL—The original cost estimates for heating the Parkside School in Hartford City, Ind., with electricity looked favorable. The "hard" facts after a year's operation are decisive, beyond dispute and on the record. Electric heat for schools is practical and economical. It also offers impressive savings in initial building cost and upkeep.

Parkside has been the focus of acute industry interest since it was built. It is a typical school building a 5600 degree day community heated electrically on a 2 cent rate from a tax-paying, investor-owned, utility system. Its cost could be compared directly with a similar building heated by oil.

Robert Lee Boyd of Electromode reports on the first year operating costs in "It's Here . . . The All-Electric School" on page 80. Are they favorable? A second wing has been completed and another school planned for Hartford City with an electric heating system.

DISTRIBUTION MODERNIZATION—Serious shutdowns or damage from electrical failures are relatively infrequent, even when the distribution system is fairly old. Therefore, management frequently is reluctant to modernize. From a practical investment viewpoint, however, modernization can justify itself in many ways,

such as by reducing the risks of production stoppages, providing flexibility and capacity for change and growth, or by protecting equipment and employees from injury. These plus numerous additional factors are effectively analyzed and illustrated in a 2-part article on "Investment in Distribution" beginning in this issue on page 93.

AUTOMATION MAINTENANCE

—From receiving, through production to shipping, manufacturing plant operations are being done more and more by machines and automatic devices representing large investments in capital goods. When production stops, this capital remains idle and all down-time costs rise sharply. This trend places greater importance upon "Maintenance for Automation", a subject interestingly discussed by R. L. Kirkpatrick, manager of the East Pittsburgh maintenance sales department for the Westinghouse Corporation. You will find his article on page 86.

INFRARED—Scores of industrial baking and heating requirements are placing increasing emphasis upon mass heating techniques, yet numerous variables admittedly make it difficult to design perfect oven enclosures and heating cycles. Knowledge of evaporation data makes it possible to closely approximate Btu or kw requirements, however, and this knowledge in turn

lessens the guesswork involved in dimensioning ovens, determining heating cycles and designing electrical controls. J. C. Hoffman of Westinghouse's Lamp Division in Bloomfield, N. J., relates all of these factors to the use of infrared radiant lamps in his presentation of "Design Data for Industrial Infrared Applications" on page 98.

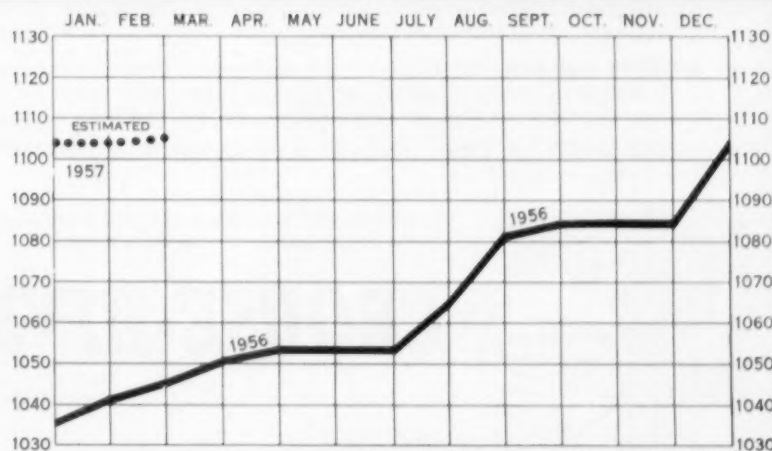
GOOD HEAT PROMOTION

—From Ed Brand of Niagara Mohawk Power Corp., Buffalo, N. Y., "Your January editorial 'Let the Customer Decide' is apropos and to the point." He reports that his company has prepared a booklet setting forth complete energy cost studies from the actual experiences of typical electric heat customers in the area. They have also introduced a Budget Plan which permits payments to be spread out evenly over the year.

BUSINESS BUILDERS—Alert contractors are adding some \$20,000 in electrical work to the typical 500-unit apartment project by selling the builder on electric heat for the bathrooms. Added to the fixture schedule, it means about \$30 for the heater plus \$10 labor, or \$40 per unit. The arrangement can also be attractive to the builder, since it eliminates plumbing or sheet metal work normally involved in bringing conventional heat to the bath.

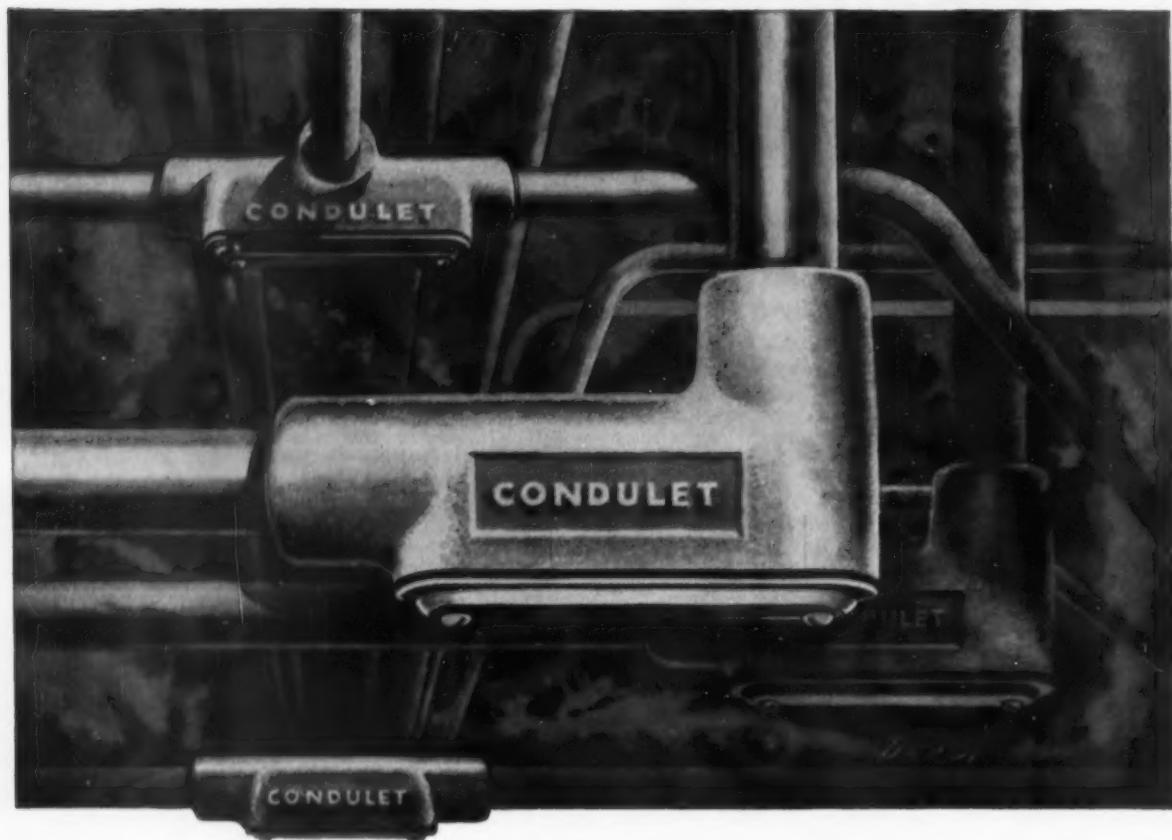
ELECTRICAL MATERIALS COST INDEX

BASE LINE IS 1000 AND REPRESENTS COSTS OF A TYPICAL ASSORTMENT OF MATERIALS FOR A SELECTED JOB AS OF NOVEMBER 1, 1951. THE INDEX POINTS REPRESENT THE VARIATION OF THESE SAME MATERIAL COSTS AS OF THE FIRST OF EACH MONTH.



SOURCE - NATIONAL PRICE SERVICE, CLEVELAND, OHIO

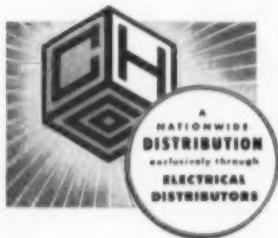
Nothing Beats CONDULETS* and RIGID CONDUIT for FLEXIBILITY, SAFETY, ECONOMY



- **INSTALL ANYWHERE.** Crouse-Hinds Condulets and rigid conduit operate safely and efficiently under all atmospheric conditions and in all occupancies.
- **INCREASE CAPACITY EASILY.** You don't have to tear out and replace the entire system; merely pull additional wires or put in a larger size.
- **ASSURES MAXIMUM SAFETY.** Condulets are Taper-Threaded to provide a permanent low resistance path to ground.
- **GREATER DURABILITY.** Condulets and rigid conduit provide circuits with more protection against physical damage than any other wiring system. Further, Condulets are made of galvanized cast Fer alloy, and resist corrosion.
- **LOWER OVER-ALL COST.** First cost is the entire cost — a minimum of maintenance is required.

COMPLETE FLEXIBILITY

There's a Condulet to meet every need of complex modern electrical layouts. See your Condulet Catalog.



***CONDULET** is a coined word registered in the U.S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

CROUSE-HINDS COMPANY

Main Office and Factory: Syracuse, N. Y.
Crouse-Hinds Company of Canada, Ltd.: Toronto, Ont.

OFFICES: Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., St. Louis, St. Paul, San Francisco, Seattle, Tulsa, Washington. RESIDENT REPRESENTATIVES: Albany, Atlanta, Baltimore, Baton Rouge, Charlotte, Chattanooga, Corpus Christi, Jacksonville, Reading, Pa., Richmond, Va., San Antonio.

Washington Report

President Eisenhower asked Congress to increase Federal spending to \$71.8 billion for fiscal 1958 (12 months starting July 1), up \$2.9 billion above this year's estimated \$68.9 billion. The President's budget, given to Congress on January 16, estimated revenues for the coming year at \$73.6 billion, leaving a surplus of \$1.8 billion for the next fiscal year.

It is expected that Congress will finally approve most of the President's request, after minor cuts and much fighting. The new budget eliminates chances for tax cuts this year, dampens outlook for the following year. Individual incomes will account for 51% of the estimated income for fiscal 1958, corporation income taxes for 29%, excise taxes for 12%, and customs and other receipts for 8%. Breakdown of where it will go is: major national security—59%; interest—10%; veterans—7%; agriculture—7%; debt retirement—2%; other—15%.

New construction outlays in 1956 were \$44.3 billion, up 3% over 1955, Depts. of Commerce and Labor reported, which made the tenth straight year that construction spending exceeded the previous year. Actual physical volume fell 2% last year, however, and the dollar volume increase stemmed from increased prices, the report noted.

Plant and equipment spending of U.S. businesses during this quarter are estimated at \$8.7 billion, up 16% from the \$7.5 billion during 1956's first quarter. Total spending in this field last year was \$34.9 billion, or 22% over 1955's \$28.7 billion.

Work on over \$1.7 billion of highway improvement was begun in the first six months following enactment of the new \$33 billion Federal highway construction program, approved by Congress last year, Dept. of Commerce reported.

Housing starts last year fell 16% from 1955, to 1,120,000 units, final Government figures indicated. This is the lowest annual level since 1953. A further drop of 20%, to 900,000 units, was forecast for 1957 by 40 members of National Association of Home Builders who met with various top Government housing and monetary officials in Washington early in January to discuss easing of credit restrictions.

The FHA increase in permissible interest rate on FHA-insured loans from 4½% to 5%, made in December, has failed to spur homebuilding activity, according to a recent Congressional staff report.

Cold weather upped power consumption to new weekly records three weeks running in January. Output for first week was 11.671 billion kwhr; for second week 12.327 billion kwhr; and for third week 12.556 billion kwhr. This was 5.6%, 6.3% and 9.0% increase over the corresponding weeks of a year earlier.

A task group representing the Electric Fuse Industry was appointed recently to work with the Electrical Equipment Division, BDSA, Dept. of Commerce, to develop statistics on capacity, output and metal consumption by manufacturers of fuses.

Some economic highlights:—Steel output in mid-January was at rate of 98.3% of capacity (1957 capacity on annual basis is 133,459,150 net tons) . . . employment during 1956 averaged 65 million persons, 1.8 million more than 1955 average, while unemployment averaged 2.6 million compared with 2.7 million a year earlier . . . consumer installment credit totaled \$31.1 billion at end of last November, up \$2.8 billion in a year . . . industrial production in December was 147% of the 1947-49 average, seasonally adjusted.

SELLING PLUSSES for You...

SERVICE PLUSSES for Your Customers



CANOPY UNITS

In 1-, 2-, 3- and 4-socket types. Furnished complete with 72" of wire leads, knockouts and screws to fit 3 1/4" or 4" round outlet boxes.



CANOPY EXTENSION UNITS

Add-a-Pipe Lengths: 6", 12", 24", 36". Add-a-Flexextension Lengths: 12", 18", 24". Curved Arm Pipe Lengths: 12" and 24". Also pre-assembled Canopy Units complete with Straight, Curved or Flexible Extensions.



BULLDOG TROLLEY and WIREMOLD UNITS

Completely assembled Swivelite Socket Units for easy positioning at any point on horizontal or vertical Bulldog Trolley Ducts. Types for #2100 and #3000 Wiremold Raceways.

when you install the

am p l e x **Swivelite Line**

SOME OF THE FEATURES

SOME OF THE FIXTURES

1. DOUBLE-BALL SWIVEL

Exclusive free-floating universal joint swivel gives your customers instant, positive fingertip positioning of lamps at any angle.

2. LUSTROUS, LASTING FINISH

The infra-red baked Deluxe Satin Aluminum Finish gives lasting satisfaction — won't chip, discolor or blister.

3. AIR FLOW VENTILATION

Your customers get longer lamp life because the 8 ventilating ports in Swivelite hoods carry off excess heat, keep lamps cooler, reduce tendency for bulb bases to loosen.

4. "ADAPT-A-UNIT" CONSTRUCTION

You can easily change Swivelite installations to meet changing needs of your customers — by adding, removing, interchanging Add-A-Pipe, Add-A-Flexextension or Curved Arm Pipe Lengths.

Recommend amplex lamps for amplex fixtures



COLORBEAMS will give your customers endless opportunities for colorful, dramatic accent lighting, easily keyed to changing seasons. 8 brilliant, sparkling, guaranteed permanent colors in indoor bulbs; 10 in indoor-outdoor.



SPOTLITES and FLOODLITES fill every need for lighting single objects or entire areas. 40 to 500W for indoor service; 75 to 1,000W for outdoor.

Your distributor carries the complete line of amplex fixtures—also the complete line of amplex incandescent and fluorescent lamps for standard and specialized lighting needs.

For descriptive literature, write

am p l e x

C O R P O R A T I O N

Dept. EC 2-57

**111 WATER STREET
BROOKLYN 1, N. Y.**



Here is DESIGN LEADERSHIP...in Action!

Save Space
with
**New EC&M
High Voltage
(2200-4800 VOLTS)
Starters**

only 30" deep!

Accessible from Front...

(Solid back) • Starters may be mounted against wall or in double row, back to back

Safe...

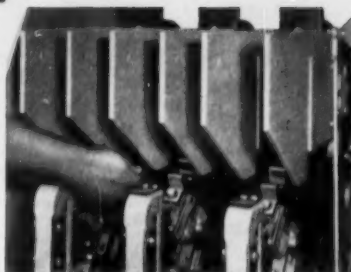
Starter DISCONNECTED from bus as door is opened
Low voltage section isolated from high voltage

Interlocked...

against accidental closure by simple rod mechanism
Large wiring space for incoming leads

EC&M's new ZHA Starter not only saves valuable floor space—it provides more accessibility and convenience than ever before. Starters are available with self-contained bus in isolated compartment. A gang of starters requires only one incoming feeder. Additional starters can be added as needed—with no sacrifice in neat, streamlined appearance. All starters are self-contained and complete with control transformer supplying low voltage for pushbutton circuits.

Write for BULLETIN 8130-F



NO DRAW-OUT NEEDED • Arc shields slide out horizontally, making front and rear contact-tips removable with standard wrench.

**3 Interrupting Ratings
for Squirrel Cage, Synchronous
and Wound-rotor Motors**

1. **CLASS E 1** • 50,000 KVA (symmetrical) based on certified tests.
2. **CLASS E 2** • With current limiting fuses and high interrupting capacity contactor. At 2300 volts: 150,000 KVA, 3 phase; 60,000 RMS amperes asymmetrical. At 4,800 volts: 250,000 KVA, 3 phase; 60,000 RMS amperes asymmetrical.
3. **VALIMITOR®** • May be used on a bus of unlimited short circuit capacity, through the use of a contactor with an interrupting rating of 50,000 KVA, and reactors which limit any fault current to a maximum of 25,000 KVA.



THE ELECTRIC CONTROLLER & MFG. CO.

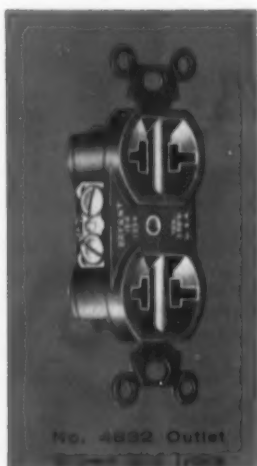
A DIVISION OF THE SQUARE D COMPANY
CLEVELAND 28 • OHIO

7955



YOU GET
SOMETHING
EXTRA
WITH
BRYANT

"Stronger...More Dependable...Easier to Install"



"I've used Bryant Wiring Devices for 30 years and found them stronger, more dependable, easier to install," says Mr. Carl Hocker of Hocker Electric Co., Gary, Ind.

Bryant 4832 duplex outlet, used by Hocker Electric since its introduction in 1930, has the Bryant quality features which assure dependable, year-after-year performance: Totally enclosed in plastic housing . . . Spring-action T contacts rigidly support cap blades for best mechanical and electrical contact . . . Locked-in mounting strap with washer type plaster ears. Large, undercut binding head screws anchor wires securely . . . One binding screw on each contact backed out for easier wiring. Staked screws cannot fall out . . . Snub holes for wire ends make wiring faster.

Listed by Underwriters' Laboratories, Inc.

THE BRYANT ELECTRIC COMPANY
Bridgeport 2, Connecticut • CHICAGO • LOS ANGELES





Mr. Knott (right) at the location of his Riverview Homes project in southwest Baltimore, Md., with Earl Schultz, Sr., Construction Superintendent.

"Concealed telephone wiring helps us sell homes"

—says Mr. Henry J. Knott, President, Home Builders Association of Maryland

"We believe that concealed telephone wiring is a strong sales feature," says Mr. Knott, "and its importance is growing every day as home buyers learn to ask for it."

"Concealed telephone wiring itself is a salable item that pleases customers. But it is more than that. Because it helps preserve the interior beauty of a house, it makes the house as a whole more salable. In the Home Builders Association of Maryland, we recommend concealed telephone wiring to all our members."

The progressive Home Builders Association of Maryland has a growing membership of 490

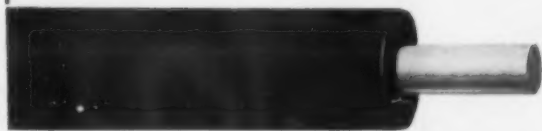
members. Last year in Baltimore City, and in Baltimore and Anne Arundel Counties, they built more than 14,000 homes. Trend-minded builders in the Association, and many others across the country, are convinced of the increasing value of concealed telephone wiring as a quality sales feature.

* * *

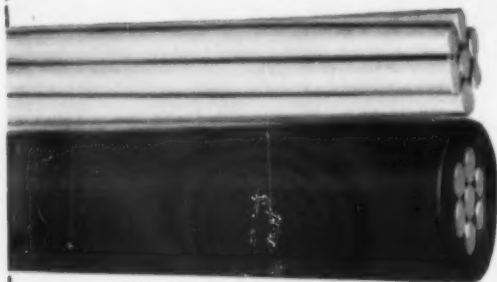
Your nearest Bell Telephone business office will help you with concealed wiring plans. For details on home telephone wiring, see Sweet's Light Construction File, 8i/Be. For commercial installations, Sweet's Architectural File, 32a/Be.

Working together to bring people together
BELL TELEPHONE SYSTEM

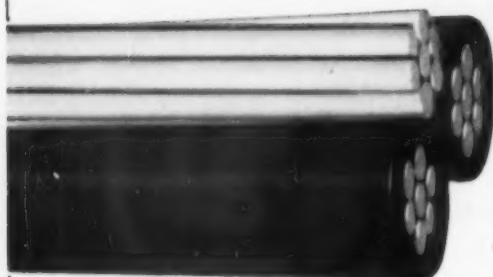




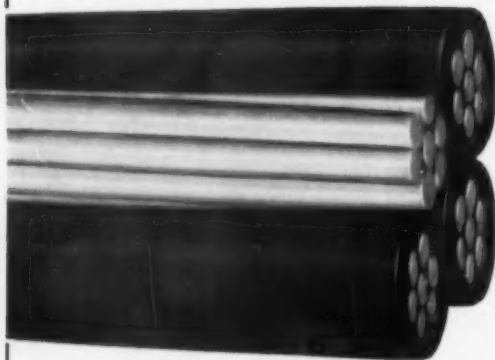
WEATHERPROOF



DUPLEX



TRIPLEX



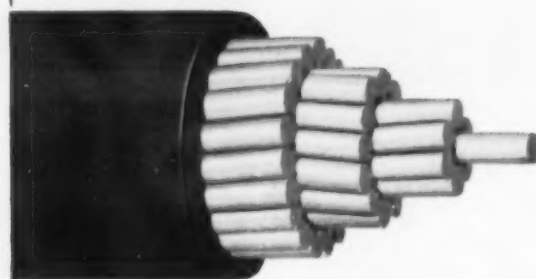
QUADRUPLIX



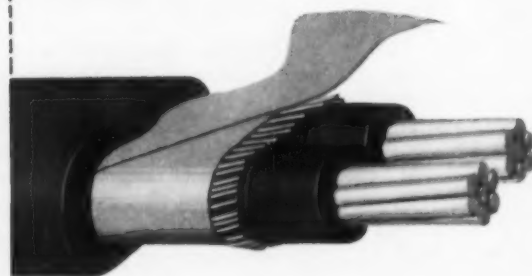
ACSR • ALL-ALUMINUM • AAAC



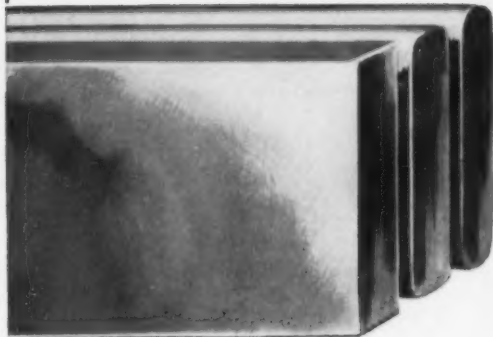
ARMORED SERVICE DROP



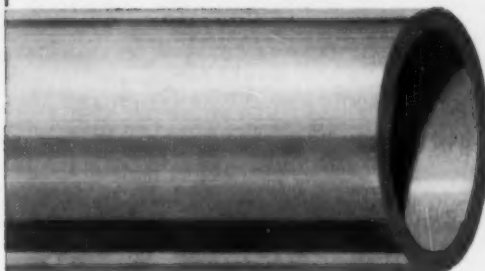
BUILDING WIRE



SERVICE ENTRANCE CABLE



RECTANGULAR BUS CONDUCTOR



TUBULAR BUS CONDUCTOR



SOLID BUS CONDUCTOR

Yes,

*your **KW** distributor carries it!*

YOUR KW DISTRIBUTOR carries a wide range of the KW products shown here. So why not take full advantage of this convenient local source of supply? Make it a habit to call your KW distributor first. (Refer to the list shown and see your local telephone directory.)

Kaiser Aluminum & Chemical Sales, Inc., *Executive Office*, Kaiser Bldg., Oakland 12, California; *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois.

See "THE KAISER ALUMINUM HOUR" Alternate Tuesdays, NBC Network. Consult your local TV listing.



Kaiser Aluminum

Aluminum is the answer to Adequate Wiring

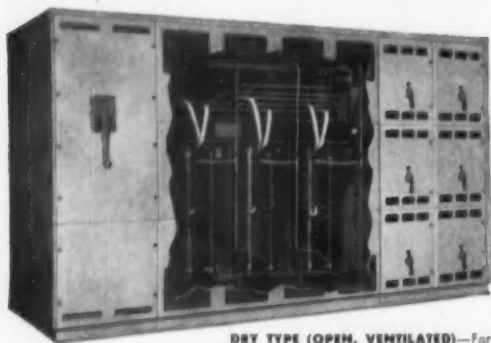
FLASH!

Kaiser Aluminum has just purchased the Wire & Cable Division of U. S. Rubber. For full details, contact any Kaiser Aluminum sales office.

Can your in-plant distribution system meet tomorrow's needs?

WAGNER UNIT SUBSTATION TRANSFORMERS

will assure continuous dependable power for years to come!



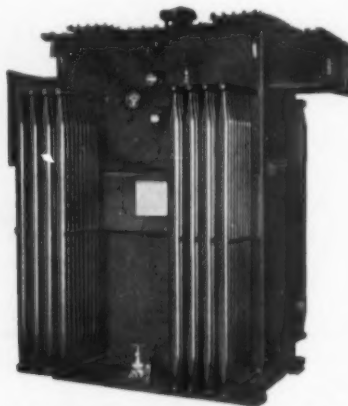
DRY TYPE (OPEN, VENTILATED)—For indoor use only. Light in weight... ideal for multi-storied buildings... no fireproof vaults necessary.



CLOSE-COUPLED. These transformers fit flush against switchgear enclosures, eliminating throats and saving space... available in ratings from 300 through 2000 kva.



NITROGEN-FILLED. These Class H, Silicone Insulated Transformers offer many advantages in maintenance and safety. Suitable for indoor or outdoor use... completely fireproof. In ratings up to 2000 kva.



OIL AND NOFLAMOL-FILLED. Oil-filled transformers are generally used outdoors. Noflamol type is filled with a nonflammable liquid making it especially suitable for locations where explosive liquids and gases are present.



BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6413 Plymouth Ave., St. Louis 14, Mo., U.S.A.

T57-S

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC



Sylvan-Aire Lighting System by Sylvania. Relighting job maintains high 80-foot candle lighting levels at table tops in Hawthorne High School's traditional-styled library. Rows of luminous plastic run between ceiling beams, are mounted flush with bottoms of beams. Installation by Tri-Service Electric Co., Paterson, N. J.

How they put good reading light into a Tudor library

... at Hawthorne (N. J.) High School

IN RELIGHTING the Hawthorne High School library, school architects S. E. Greydanus & Son (Paterson, N. J.) used a successful new approach. They specified Sylvan-Aire . . . Sylvania's wall-to-wall lighting system . . . had it divided into separate panels of light between ceiling beams. The rows of translucent plastic shielding were mounted flush with the bottoms of the ceiling beams.

Over-all effect: Clean, straight ceiling lines . . . a soft, even illumination spread over the entire floor area, blending with the traditional room décor.

Over-all result: Good reading illumination levels of 80 footcandles maintained in all parts of the room, including those corners most distant from windows . . .

a true shadow-free, glare-free effect. Seeing and reading are easier, room atmosphere is more inviting and conducive to good work and study habits, desk lamps and reading lights become outmoded.

A complete lighting plan to fit your specific school needs can be tailored from Sylvania's complete line of lighting systems and fixtures. We suggest you talk to the Sylvania Lighting Specialist in your area. Or if you prefer, write direct for our free helpful booklet, "Some Whys and Hows of Modern School Lighting," or for other specific data.

SYLVANIA ELECTRIC PRODUCTS INC.
Dept. B-40, Lighting Division—Fixtures
One 48th Street, Wheeling, W. Va.



SYLVANIA

... fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY



Cable splices made faster, last longer in toughest "proving ground" here in The Bessemer Limestone and Cement Company's quarrying operation. Note the rough surfaces over which the cable is dragged. Under conditions that vary from extreme dryness to complete submersion, Bessemer reports exceptional results from the rugged splices made with Okonite Tapes.

Okonite Tapes reduce down-time for Bessemer shovels

The Bessemer Limestone and Cement Company has reduced down-time on its electric shovels two ways by using Okonite Tapes in splicing its high voltage portable shovel cables. First, tough, waterproof splices can be made in the field without taking the cable to the shop and without buying any special molds and other equipment. Second, splices made with Okonite Tapes have been in service since 1948 without added time-loss in remaking.

Cables and splices are dragged over rocks, frequently lie completely submerged in water, and are constantly exposed to sun, rain, snow and ice. Yet Okonite splices have maintained their waterproof toughness for seven years of this treatment. No wonder Bessemer has standardized on Okonite Tapes.

Each splice is designed to give maximum electrical and mechanical protection for operation at 4160 volts. Okolite Corona-Resisting Tape fuses into a solid wall of self-vulcanizing high voltage insulation. Over the shielding tape applied about the three-conductor core, a solid wall of Okoprene Weather-Resistant Tape gives full neoprene protection to the splice. This combination of Okolite and Okoprene Tapes provides the toughness and complete moisture resistance necessary for continued service under such severe operating conditions.

Specify Okonite tapes for the tougher jobs. Get them from your Okonite Tape Distributor, or write to The Okonite Company, EC Tape Department, Passaic, New Jersey.

Available Through Authorized Distributors Only.

OKONITE

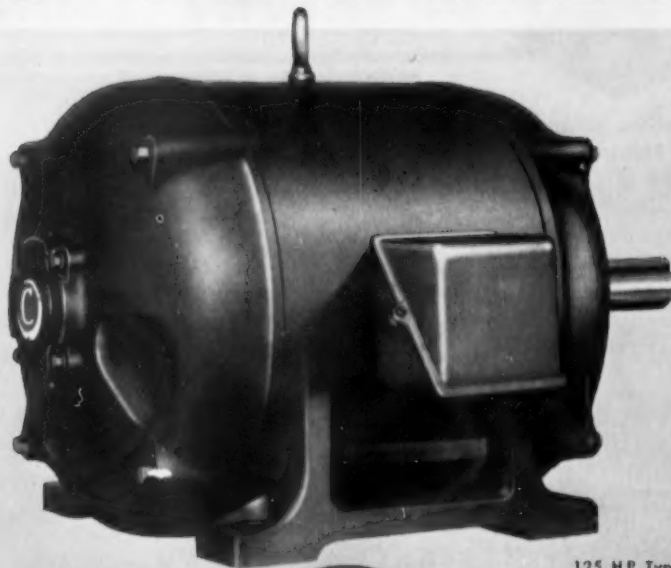
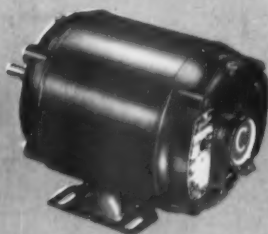


splicing tapes

CENTURY HAS THE COMPLETE LINE...

Big as 400 H.P.

small as 1/20 H.P.



125 H.P. Type 5C

WHATEVER YOUR APPLICATION THERE'S A



MOTOR

Performance-Rated[®] to do the job

You'll get the top performance your equipment's designed for... because there's a motor *designed for it* in the Performance-Rated Century line.

Century's technique of Performance-Rating enables you to choose motors with the right size, speed, frame, and torque characteristics to fit—*exactly*—your application requirements.

You can select from a range of 400 to 1/20 h.p.; AC single or poly-phase, or DC; drip proof, dust proof, or explosion proof frames. There are optional corrosion-resistant features; constant speed, multi-speed, varying or geared speeds.

Let us prove the value of Performance-Rating for you... without obligation. Call or write your nearby Century District Sales Office or Authorized Distributor.

Performance-Rated[®]
MOTORS
1/20 to 400 H.P.



CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri • Offices and Stock Points in Principal Cities



WALTER D. VANCE, JR., Vice President • California Electric Co., reports:

**"We saved 14 days installing
527 fixtures by using
'UP-RIGHT' Scaffold-on-Wheels"**

Man-hour savings on this General Motors warehouse job amounted to over 40%. Up-Right Scaffold is so light it is easily assembled by one man. Individual 1 piece aluminum alloy sections are unfolded and set one on top of the other. They lock into place instantly.

**14' tower
assembled in
2 minutes**

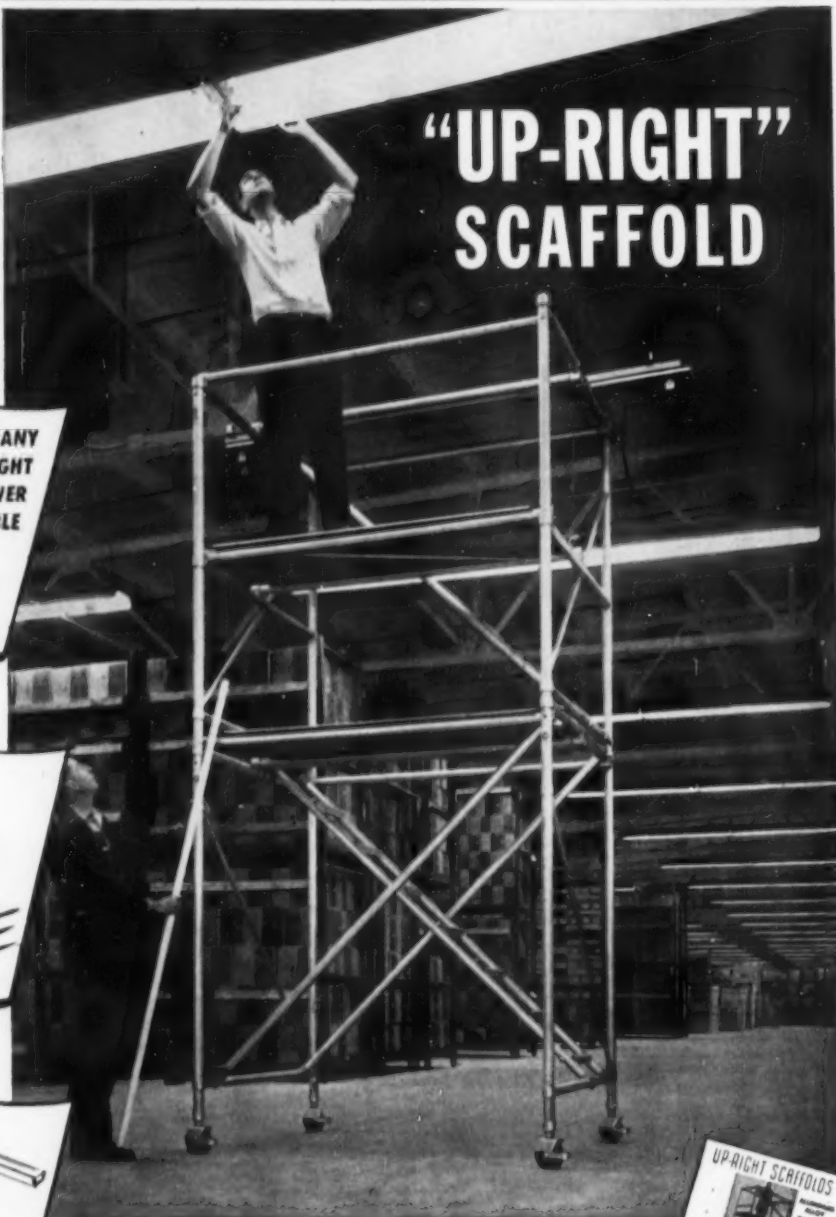
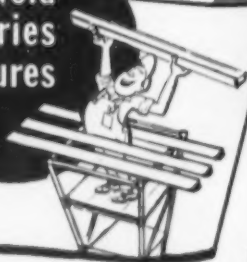


**ANY
HEIGHT
TOWER
AVAILABLE**

**Rolls
with job**



**Scaffold
carries
fixtures**



Write for descriptive circular ➡

"UP-RIGHT" SCAFFOLDS

Dept. 159 • 1013 Pardee Street • Berkeley, California

Factories: Berkeley, Calif. and Teterboro, N. J. • Offices in all principal cities



you get DOUBLE PROTECTION with every KILLARK electrolet!



1 ALUMALLOY...FOR STRENGTH WHEN YOU INSTALL IT...

You'll see durability from the very first moment you install a Killark Electrolet. The metal itself has been greatly improved since the aluminum alloy fitting was introduced 10 years ago. New Killark Alumalloy, through modern metallurgical research, has greater-than-ever strength, better resiliency to shock and strain. Killark fittings are, in fact, *unconditionally guaranteed against breakage.*

For Longer Life...

Greater Customer Satisfaction

...SPECIFY

2 PROTECTIVE COATING...FOR CONTINUED STRENGTH AFTER YOU INSTALL IT!

You'll appreciate the "built-in" strength of a Killark Alumalloy Electrolet more and more as the years roll by. It won't rust, it's more resistant than iron in corrosive atmospheres. And now Killark's new KPC-56 Protective Coating adds a "first line of defense" even for *highly corrosive areas.* So you see, rain and weather run off a Killark fitting like water off a duck's back.



Killark

... A FITTING NAME TO REMEMBER

ELECTRIC MANUFACTURING COMPANY

Vandeventer and Easton Aves.

St. Louis 13, Missouri

SALES OFFICES and
WAREHOUSE STOCKS

SALES OFFICES

Atlanta
Boston
Buffalo
Chicago
Cincinnati

69 Mills St., N. W.
49-51 D St.
278 Johnson St.
1528 West Adams St.
1031 Meta Dr.

Dallas
Denver
Detroit
Los Angeles

1903 Griffin St.
1073 Galapago
8319 Mack Ave.
412 Seaton St.

Philadelphia 2014 Chancellor St.
Pittsburgh 4830 McKnight Road
San Francisco 714 Harrison St.
Seattle 4130 First Ave., So.

Baltimore
Columbus

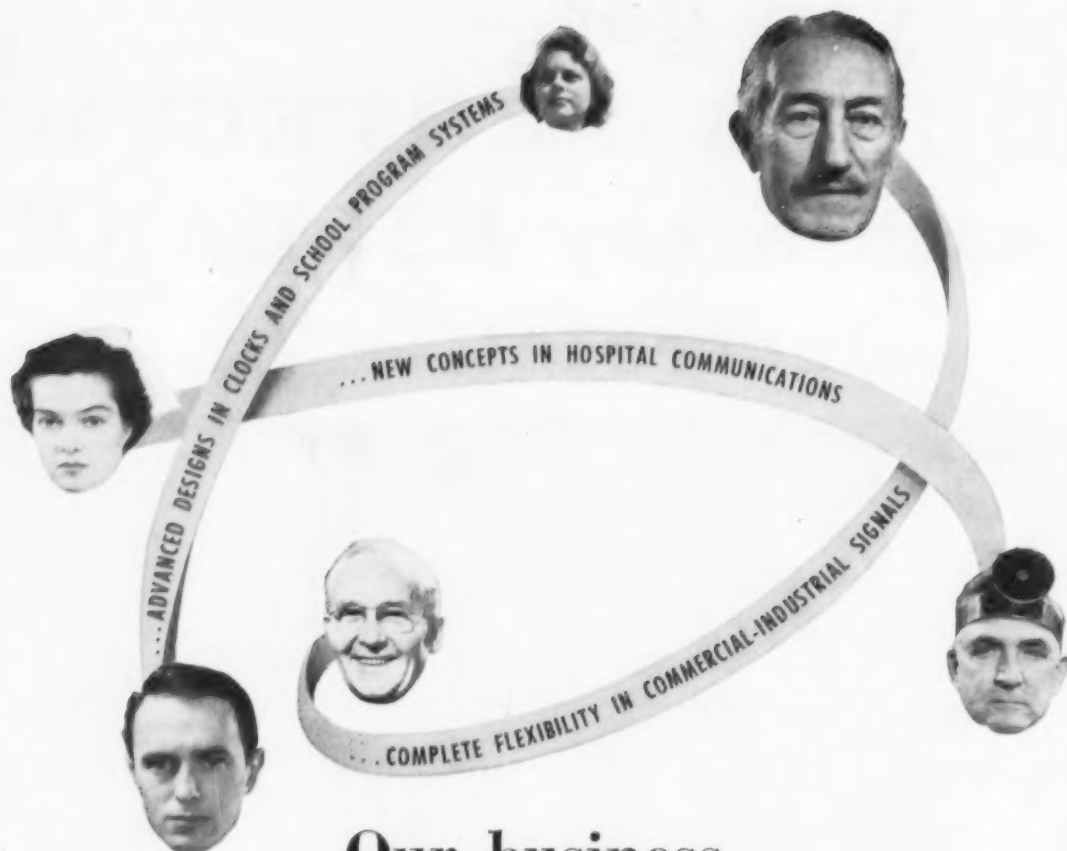
11 W. 25th St.
2700 E. Main St.
Sales Offices and Warehouse Stocks throughout Canada

Kansas City, Mo.
Minneapolis

616 W. 26th St.
826 Andrus Bldg.

New York

600 W. 181st St.



Our business is communications



Your customers will appreciate the many advantages of Sperti Faraday precision engineered signal systems. From a simple buzzer to Visicall, the electronic marvel that lets you see and talk, you can always depend on Sperti Faraday, pioneers in the industry, for the latest developments in visual and audible communication systems.

You can rely on Sperti Faraday to speed the flow of goods and services in all stages of production and in all walks of life. Pioneers in industrial, commercial and institutional signaling systems, Sperti Faraday precision engineered products meet today's need for maximum efficiency in audible and visual communications.

For information on how Sperti Faraday engineering can help increase efficiency while lowering your cost of communications, write to Sperti Faraday, Inc., Adrian, Mich. In Canada, write Sperti Faraday, Ltd., Montreal.



Designers and Producers of Visual and Audible Signals Since 1875

Adrian, Michigan

Offices in 36 principal cities in the U. S. A. and Canada

Inquire today about these Sperti Faraday engineered products.

Annunciators • Door Openers
• Transformers • Contact De-
vices • Sirens • Visicall •
Synchronous Clocks • Fire
Alarm Systems • Electric Clock
Systems • Freezer Alarms •
Plugmaster Cord Sets.

*easiest
readings
you ever
took!*



NOW—A MULTI-RANGE SNAP-AROUND VOLT-AMMETER FOR ONLY **\$39.85**—AND FOUR WAYS EASIER TO READ THAN ANY TEST-INSTRUMENT OF ITS KIND.

1. **CHANGE THE RANGE WITH ONE HAND.**
(Range selector knob is right next to your thumb.)
2. **SEE ONLY ONE SCALE AT A TIME.**
(4 current ranges, 2 voltage ranges—each on a scale of its own when you turn the knob.)
3. **NEW MAGNIFIED DIAL... LONGER NEEDLE SWEEP.**
(Greater visibility, greater accuracy than ever before.)
4. **POINTER-LOK "FREEZES" POINTER AT READING.**
(Use the RS-1 any place your hand can reach... even where you can't see the scale. Needle can be locked in place and read away from conductor. Then move it to where you can see it. Pointer stays locked.)

New, advance-design AMPROBE® "RS-1"

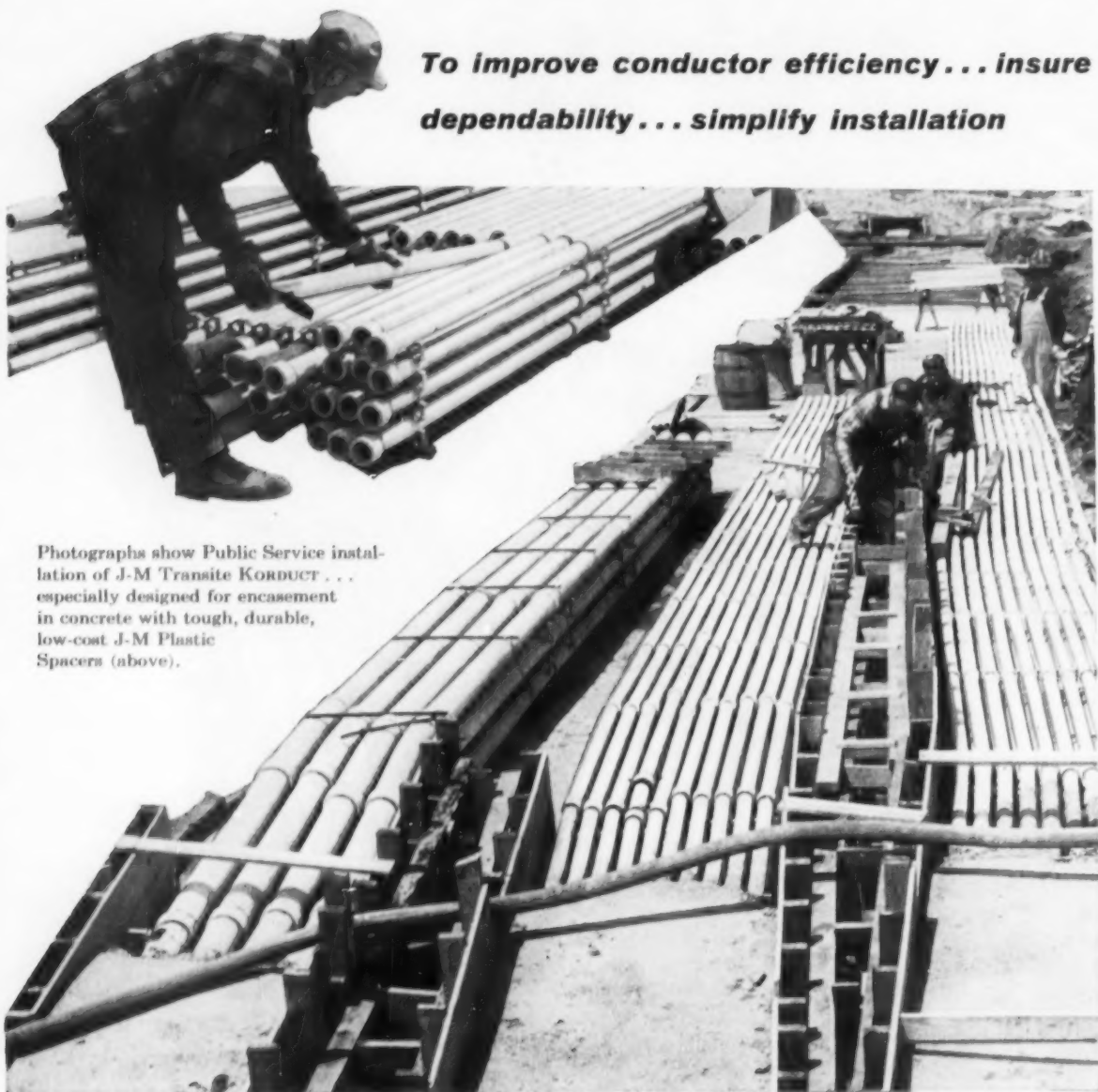
Advance construction, too! Recessed range-selector knob can't be moved accidentally... Simple bayonet leads lock in at bottom for quick connecting... Impact-proof case won't crack or chip; non-slip ribbing keeps it firmly in your grasp... Advanced printed circuit construction: no wires to come loose.. Shielded core magnetic movement... New, improved, fitted leather carrying case hooks onto your belt. The new RS-1 is one of the 14 Amprobe models priced from \$19.85 to \$67.50. There's an Amprobe for every job and every budget. Pick up the one *you* need tomorrow.

don't guess at it; Amprobe it!*

*®

PYRAMID INSTRUMENT CORPORATION, Lynbrook, N. Y.

To improve conductor efficiency... insure dependability... simplify installation



Photographs show Public Service installation of J-M Transit KORDUCT... especially designed for encasement in concrete with tough, durable, low-cost J-M Plastic Spacers (above).

Public Service of New Jersey chooses Transit asbestos-cement Ducts

Economical Transit Ducts are part of Public Service Electric and Gas Company of New Jersey's plan for top operational efficiency at the new Linden Generating Station. With Transit Ducts on power circuits, current-carrying capacities are higher... copper losses lower... because Transit dissipates heat faster than organic ducts.

Johns-Manville Transit Ducts protect control circuits permanently. Transit will never rot, rust or corrode, is incombustible and non-inductive, be-

cause it is made of asbestos and cement.

Transit is easy to install... light, 10-foot lengths require fewer joints... direction changes are easy with the wide variety of Standard Transit fittings. And the unusually smooth bore permits easy cable pull-through and prevents injury to cable sheath.

For complete information on Transit Ducts, write to Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.



Johns-Manville TRANSITE® DUCTS

CONDUIT for exposed work and installation underground without concrete encasement

KORDUCT® for installation in concrete



The most beautiful money in the world...
is made for you by Honeylite !



HONEYLITE combines maximum efficiency with maximum beauty.

HONEYLITE is easier to install.

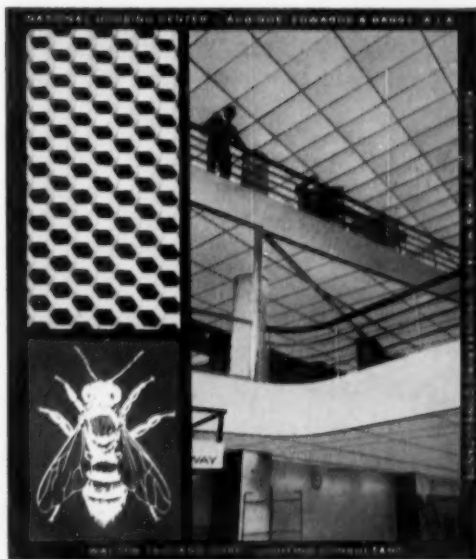
HONEYLITE is suitable for every application. UL approved.

Used in full ceiling lighting, in recessed troffers and in all types of lighting fixtures, HONEYLITE transmits the most light with the lowest surface brightness.

HONEYLITE may be used in all types of T-bar suspension systems. Because of its low weight (2 oz. per sq. ft.) and inherent acoustical properties, HONEYLITE requires a far less complicated suspension system than any other light diffusing material.

HONEYLITE can be incorporated in any lighting installation — suspended louvreall ceilings, troffer diffusers, industrial and commercial fixtures.

For price lists and detailed information see your local distributor or write to Dept. EC, Hexcel Products, Inc., 951-61st Street, Oakland 8, California.



HONEYLITE*

LIGHT-DIFFUSING ALUMINUM HONEYCOMB

A development of HEXCEL PRODUCTS INC.



KERRIGAN

Lights the Way!

Kerrigan Weldforged lighting standards are now found in cities all over the country—in parks and parking centers, on streets, highways and bridges—service stations—sports fields—wherever there is a need for modern lighting. Tall, tapered and handsome, Kerrigan lighting standards are *Weldforged* of high-strength, low-alloy steel, or from aluminum. Maximum strength is combined with beauty of design to meet the highest engineering standards and conform to I.E.S. Street Lighting Codes. Kerrigan standards weather both the elements and the years.

Let us send you detailed descriptive catalog and specifications. Write now for your **FREE** copy.



For better lighted streets, bridges and highways the standard is Kerrigan!



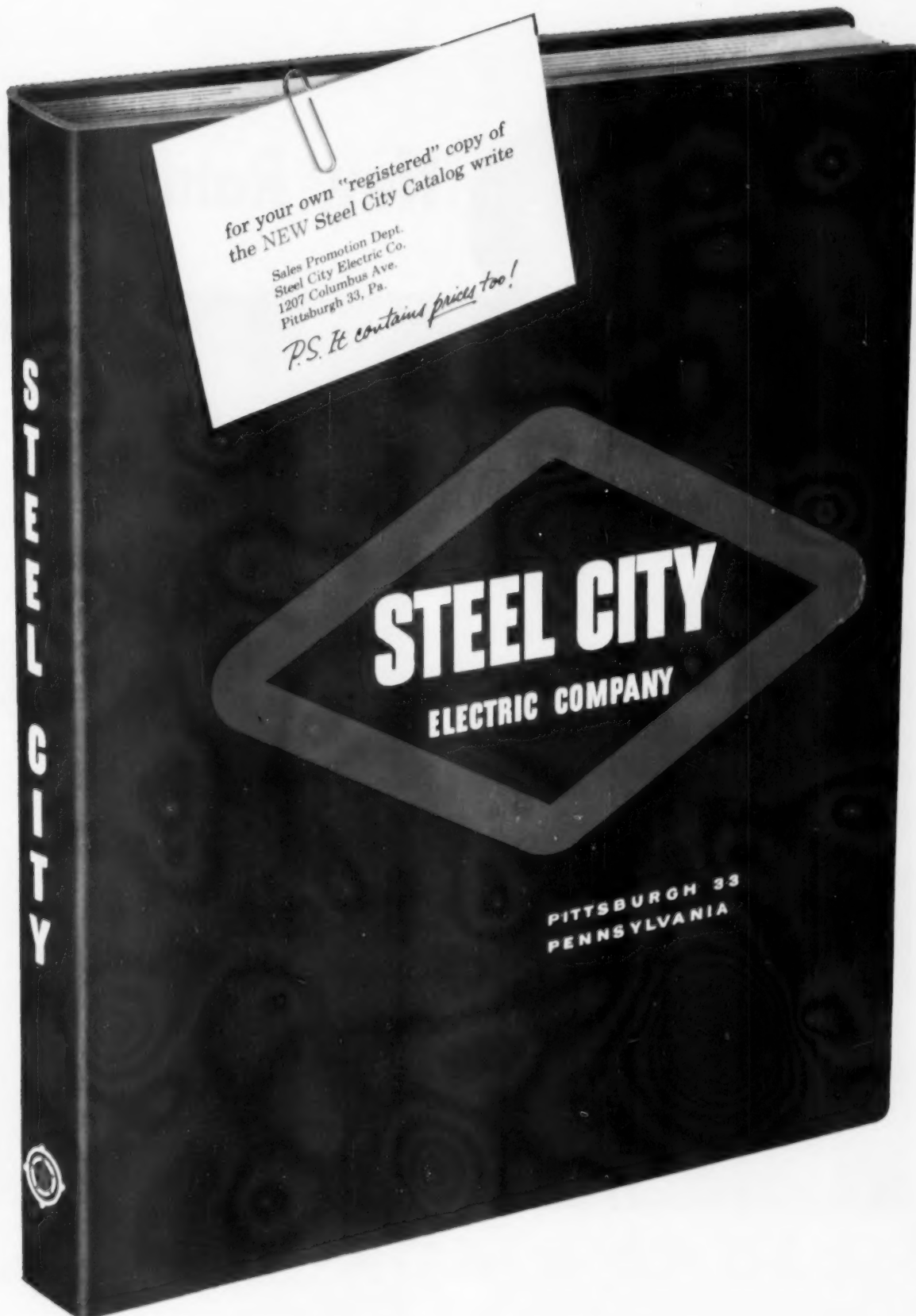
KERRIGAN IRON WORKS, INC.

NASHVILLE, TENNESSEE

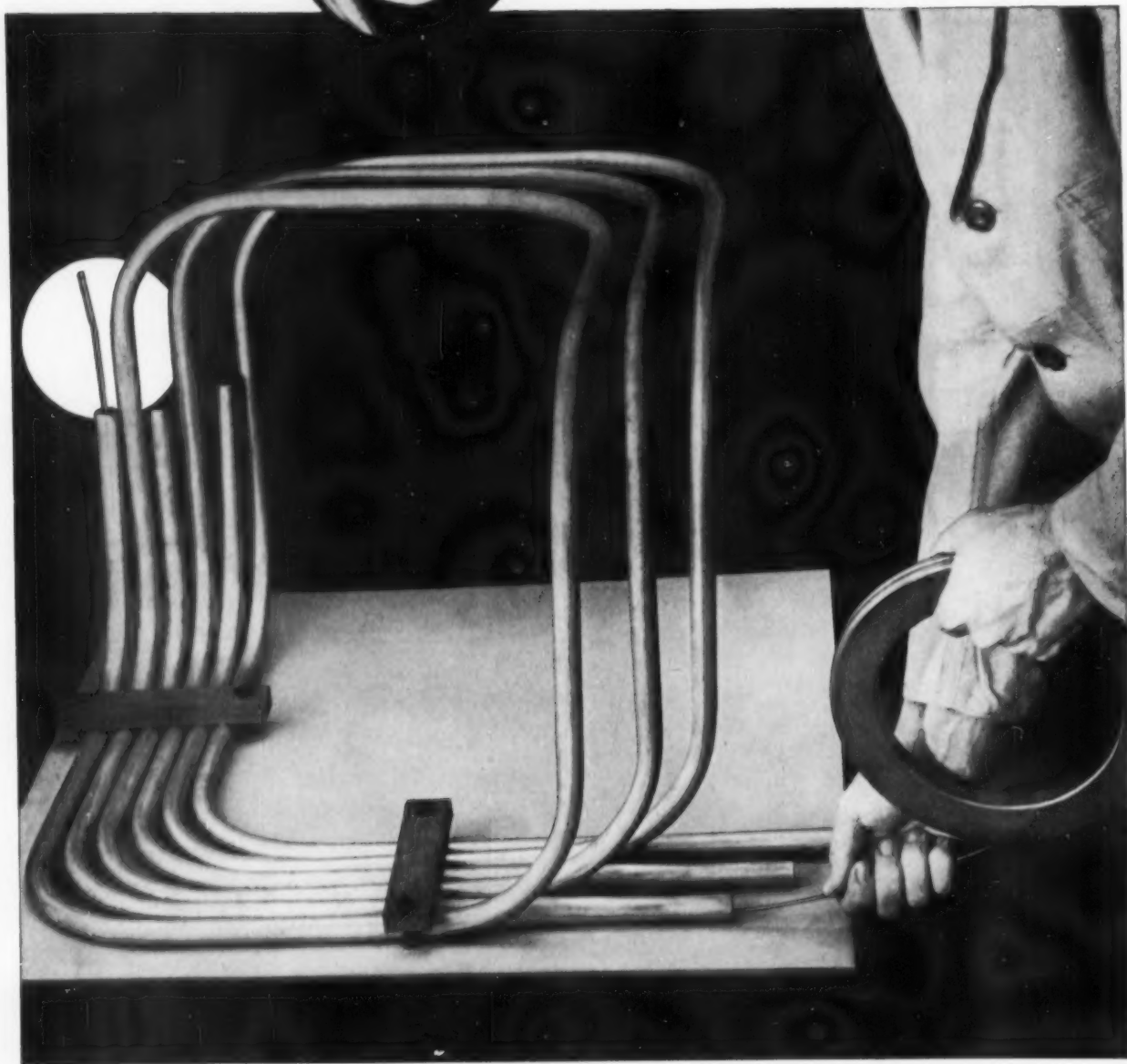
General Sales Office

274 Madison Ave.

New York City



New Rome EMT



Fish-Tape Slips Right Through Rome EMT. No amount of forcing would get a $\frac{1}{8}$ -inch fish tape through two competitive lengths (behind Rome EMT). Here the same tape is shown as it slides right past all eight 90-degree bends in the Rome EMT.

proved best in fish-tape test

Actual comparison test proves Rome EMT easiest to fish

In recent tests, Rome Cable's EMT came out first in fishability. Disinterested observers checked the results with X-ray photos.

How the test was conducted:

Disregarding the National Electrical Code's limit of four bends, technicians bent a whole series of ten-foot lengths of 1/2-inch EMT into identical eight-turn runs for testing purposes.

A standard 1/8-inch fish tape was then run into the test samples. It went easily through all eight bends in Rome EMT. In every competitive sample, the tape stuck fast at one of the bends!

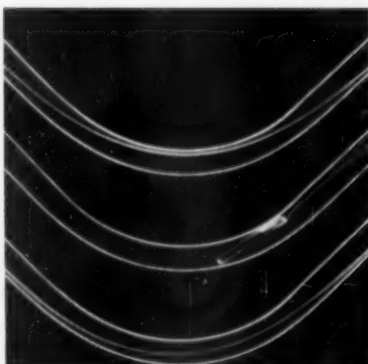
Why Rome EMT is easiest to fish

A shiny new interior lets fish tapes slide through with an absolute minimum of resistance. Careful baking—under rigid control—puts a uniformly smooth enamel finish inside Rome EMT.

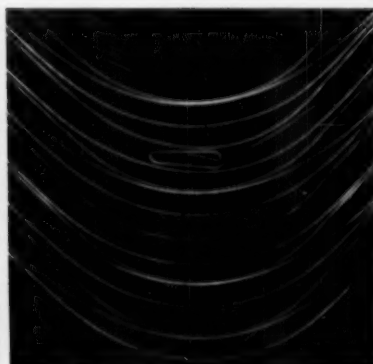
Test it yourself

Pick any competitive EMT, bend it identically with a length of Rome EMT, and then try the fish-tape test. You'll find that Rome Cable wins every time in this test of direct comparison.

Specify Rome EMT for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 902, Rome Cable Corporation, Rome, N. Y.



Manufacturer "A" A 1/8-inch fish tape is being forced into this competitor's EMT. The X-ray photo (top) shows how the tape stuck fast on the fourth bend—as a result of a high-friction inside finish.



Manufacturer "B" The same fish tape is being run into another competitor's EMT. The X-ray photo shows the tape—stuck here on the seventh bend. Inside surface resistance caused this tape to stick.



Disinterested Observers from the Anstice Co., Inc., Rochester, N. Y., take X-ray photographs during tests. The photographing was witnessed by Chester Uffelman, Notary Public.

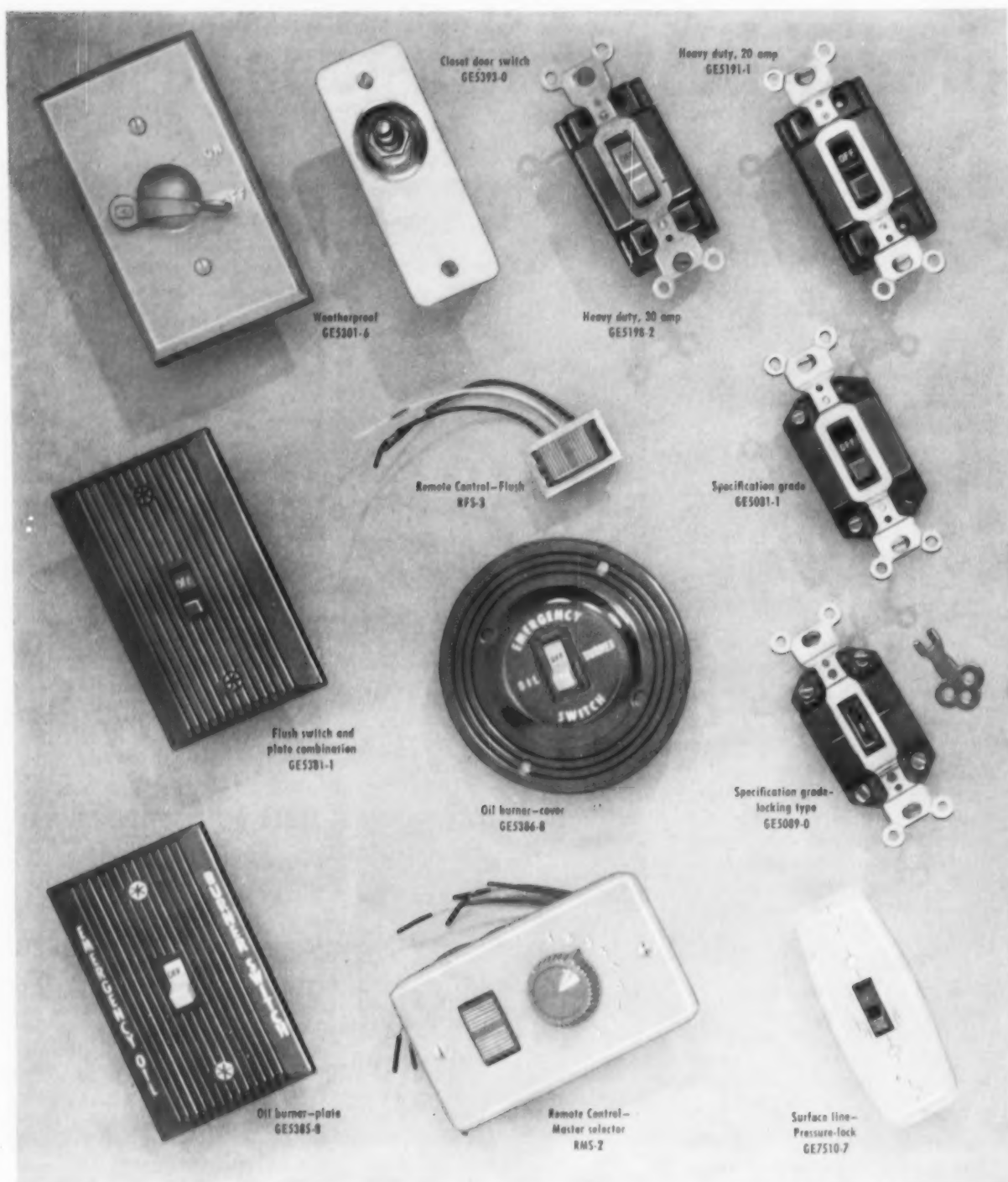
STOCK DISTRIBUTION CENTERS

Atlanta, Ga.
Chicago, Ill.
Dallas, Texas
Denver, Colo.
Houston, Texas
Kansas City, Mo.
Los Angeles, Calif.
Rome, N. Y.
Salt Lake City, Utah
San Francisco, Calif.
Seattle, Wash.
St. Paul, Minn.
Torrance, Calif.

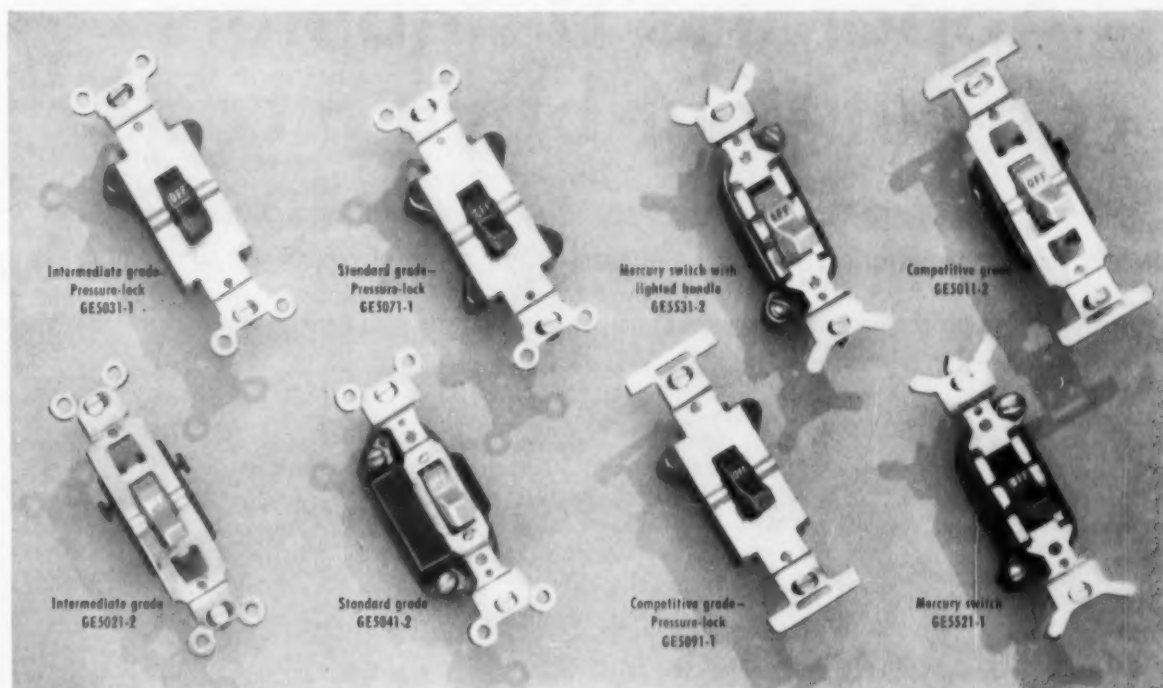
ROME CABLE

C O R P O R A T I O N

The complete line of General Electric Switches



helps you make a full profit on every kind of job



Intermediate grade—
Pressure-lock
GES031-1

Standard grade—
Pressure-lock
GES071-1

Mercury switch with
lighted handle
GES531-2

Competitive grade
GES011-2

Intermediate grade
GES021-2

Standard grade
GES041-2

Competitive grade—
Pressure-lock
GES091-1

Mercury switch
GES521-1

For your next job, select from the more-than-150 switches made by G. E.

General Electric makes more than 150 different switches in order that you can choose one with exactly the right features and the right price for every job you do. Secondly, General Electric has built into these switches a number of advantages that make your installations faster and more profitable—advantages like pressure-lock terminals and $\frac{7}{8}$ " plaster-cleaning mounting screws. And G.E. doesn't leave the screws loose in the carton; they are held in the switch strap by fiber washers, ready for mounting. Third, General Electric "extras"—like lighted-handle mercury switches

and remote-control switching—give alert contractors a chance to upgrade those jobs where plus features are equally as important as price.

Ask your nearest General Electric distributor to demonstrate and tell you more about the complete line of competitively-priced, time-saving, dependable General Electric switches. At prices he will quote, you'll see why it is more profitable to use General Electric switches on your next wiring job. General Electric Company, Wiring Device Department, Providence 7, Rhode Island.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

AC switch—15 amp
GES411-1

AC switch—20 amp—277 volt
GES451-2

How General Electric Apparatus Distributors can cut your buying costs

Your General Electric Distributor's local stock, fast delivery and technical assistance can help you buy electrical equipment more efficiently. This series of reports will show you how



THE GENERAL ELECTRIC DISTRIBUTOR on the job. Trained countermen give off-the-shelf delivery on thousands of electrical items. Meanwhile a staff of outside salesmen keep customers up-to-date on new developments in electrical apparatus. And a team of expert estimators, buyers, stock handlers and truck drivers speed delivery, keep purchasers' costs down.

Selling isn't always the big problem of manufacturers and contractors today: buying efficiently and wisely is just as important, particularly in the case of complex electrical equipment. The businessman, especially if his is not a "big business," often hasn't the time, the staff, or the resources to deal with a number of individual suppliers. Yet, he needs expert help in buying complicated electrical apparatus. He solves this problem by turning to his local distributor. We feel that it is to his advantage to call a General Electric Apparatus Distributor.

The G-E Apparatus Distributor can perform time-and-money-saving services that most electrical equipment users can't get any other way. For example, there is a G-E distributor in every important trading area. A phone call will bring him running. When he arrives he offers not just one or two products, but several thousand, probably everything you need for your electrical job. Most of these products he has on hand, in his warehouse. If not, he knows how to get them quickly and efficiently.

This new series of reports will describe the many ways in which your General Electric Distributor can help you. General Electric is proud of its distributors. We think you are entitled to know how well they can serve you. In the reports to follow, we will show with facts, figures and examples, how:



ESTIMATORS give quick quotes on products.



DELIVERY is often only minutes away.

1. Local stocks save time and money. G-E Distributors have what you need, where you need it, when you need it.

2. Distributors train their men to serve you better. G-E Distributors never stop going to school. You'll be interested in the thoroughness of their training and in seeing how it means better service for you.

3. General Electric backs up its distributors with the best technical knowledge and help available. Distributors maintain liaison between you and us. The resources of General Electric are always at your service, through your local distributor.

4. A distributor can reduce your hidden purchasing costs. Only part of the total cost of a product is listed on the invoice. Your distributor can help you cut down on those other costs that are "hidden" until you pay them.

5. Distributors can help you plan ahead. A wrong step in electrifying a plant today can cost thousands. Your contractor will work

with your distributor to make sure your plant has the right equipment, in the right amounts.

6. Your distributor's warehouse can be your warehouse. Taxes, insurance, disaster losses, obsolescence—these are some of the bills your distributor can pay for you. How? By warehousing equipment for you until you need it.

7. Distributors can help you grow. If you are planning to expand, call in your distributor now. His advance knowledge of new G-E products and technical developments can be invaluable.

To make the most of your distributor have a talk with him; let him show you how to capitalize on his constantly improving service. If you don't know your distributor's name, write National Manager, Distributor Sales, General Electric Company, Schenectady 5, N. Y.

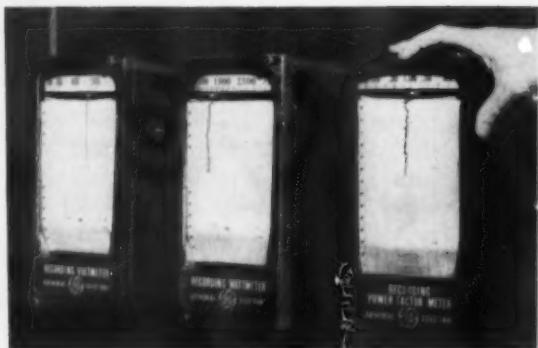
340-32

These Are Some of the Products Sold by General Electric Apparatus Agents and Distributors

- fractional hp motors
- 1-5 hp integral motors
- distribution and power transformers
- arresters
- cutouts
- push buttons
- manual and magnetic starters
- relays and solenoids
- electric instruments
- time switches
- heaters and soldering irons
- watt-hour meters and sockets
- air circuit breakers
- switchgear
- rectifiers
- capacitors

Progress Is Our Most Important Product

GENERAL  ELECTRIC



▲ Power factor meter records Huyck & Sons' plant power factor. Maintaining high power factor with capacitors has meant savings on power bills for 25 years at the Rensselaer plant.

◀ James G. Armstead, maintenance engineer, and T. R. Butman, electrical foreman, inspect G-E capacitors installed at Huyck & Sons in 1931.

Since 1931 General Electric capacitors have saved money for F. C. Huyck & Sons

That's what James G. Armstead, maintenance engineer at F. C. Huyck & Sons, Rensselaer, N. Y., says about the first General Electric 5-kvar Pyranol® capacitors ever installed. According to Mr. Armstead, "These capacitors have been saving us money for 25 years."

In February 1931, F. C. Huyck & Sons, manufacturers of papermaker's felts and engineered fabrics for industry, installed 90 General Electric capacitors to improve power factor and increase system efficiency. To keep pace with increasing production, Huyck & Sons later added more G-E capacitors; their system now includes approximately 750 capacitor kvar.

The result of these capacitor applications has been an average plant power factor of 94 percent. Since Huyck & Sons has a kvar demand clause in its electric utility contract, this high power factor has meant monthly savings on power bills.

Mr. Armstead also pointed out the long life of the General Electric capacitors.

"We set up our equipment depreciation on a 20-year basis,"

he said. "These capacitors are now saving us even more money."

Even the original capacitors, during 25 years of service, have required very little maintenance. According to Mr. Armstead, "We inspect them from time to time to check the fuses—otherwise they just sit and save."

Perhaps capacitors can sit and save for you, too. If you use induction motors, check your power factor—or ask your G-E sales engineer to do it for you. Then check your utility power contract to see how much you will save by raising your power factor. You will be able to determine in advance how much you will save on power bills by installing capacitors. For more information on industrial power capacitors, write for bulletin GEA-5632, "How to Use Capacitors." General Electric Company, Section 441-43, Schenectady, N. Y.

*Registered trademark of General Electric Co.

Progress Is Our Most Important Product
GENERAL  ELECTRIC

Announcing the new General Electric WHITE MERCURY LAMP



RECOMMEND the new General Electric White Mercury Reflector Lamps to all your customers now using mercury lamps—unless color discrimination is of great importance. They operate on the same 400-watt mercury equipment—and look at these bonus features:

- 1 UP TO 63% MORE LIGHT ON WORK FROM PRESENT FIXTURES:** Because a brand new phosphor generates more white light than ever before, your customers get from 7% to 63% more light on the work, depending upon the type of lamp being replaced. (See below).
- 2 UP TO 33% LOWER COST OF LIGHT:** With this increase in efficiency, the unit cost of light can go down from 7% to 33%. (See below).
- 3 LOWER INITIAL COST PER FOOTCANDLE:** Your customers can get more light with the same number of fixtures.

You can offer these money-saving features to your customers by recommending new General Electric *White Mercury* Reflector Lamps. The lamps are ideal for the newer, open-top reflectors that eliminate the old-fashioned "cave-like" effect in plants. Their specially designed strontium magnesium orthophosphate phosphor converts ultra-violet radiation into more white light than ever possible before. It's also an efficient reflector—sealed in against dirt and fumes.

Offer these advantages *now*. Recommend the new G-E H400 RW-1 to your present mercury lamp users. For more information write: General Electric Large Lamp Dept. ECM-2, Nela Park, Cleveland 12, Ohio.

ADVANTAGES OF NEW G-E WHITE MERCURY OVER OTHER G-E 400-WATT MERCURY LAMPS

NEW RW-1 vs A-1 (clear glass)

- 55% to 63% more light to the work
- 27% to 33% lower cost of light
- Less maintenance
- Whiter "Color"



NEW RW-1 vs E-1 (clear glass)

- 28% to 31% more light to the work
- 16% to 23% lower cost of light
- Less maintenance
- Well suited for use in upward light fixtures
- Whiter "Color"



NEW RW-1 vs J1 (color improved)

- 37% to 40% more light on the work
- 24% to 30% lower cost of light
- Less color improvement



NEW RW-1 vs RC1 and R1 (reflector shape)

- About 7% more light on the work
- 7% lower cost of light
- Less color improvement for RC-1 users



Progress Is Our Most Important Product

GENERAL  ELECTRIC



Fluorescent fixture noise is due to ballast noise, fixture amplification, type of ceiling, etc. G-E ballasts are designed to operate quietly and give you a "Sound Rated" installation every time.



G.E. has designed a three-piece core assembly with push-on clamps. All air gaps are cemented and special coil wedges reduce vibration in the core and coil assembly. A special potting compound aids in noise reduction.



G.E.'s new sound laboratory pays off in quieter ballasts for you. Sound engineers test every new design and spot check production models in an attempt to find new methods and materials to give you a quieter ballast.

Adequate light, yes—But WHAT'S THAT HUMMING?

Many fluorescent lighting installations are furnishing the specified light, but they are also furnishing an unspecified distraction—noise.

Every ballast has a normal magnetic hum. However, the intensity of the humming in fixtures is not only dependent upon such factors as basic ballast construction and the ballast rating, but fixture construction and installation can also contribute to a large extent to noise amplification. And because of these variable factors, fluorescent lighting installations can range all the way from silent to noisy and annoying.

General Electric's new, exclusive Sound Rating Calculator now makes it possible for specifiers of fluorescent lighting installations to determine beforehand whether or not they will encounter a ballast noise problem.

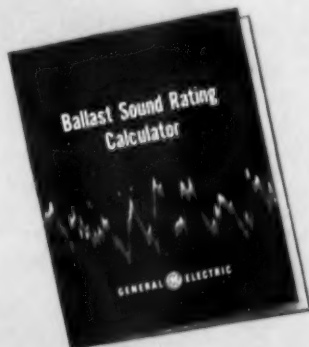
It's done this way: The average sound level of every General Electric ballast

currently listed has been measured. This measurement is called the sound rating and is stamped on each ballast case. By knowing this rating, the number of ballasts in the installation, the size and acoustical characteristics of the room, and the ambient sound level you can determine whether or not you will have a sound problem. All you have to do is set up the information in the calculator wheels. It's as simple as that. See how to get your copy of the G-E Sound Rating Calculator below.

Make certain you take advantage of this new development from General Electric while current projects are in the planning stages. Send for the Ballast Sound Rating Calculator and be sure of a General Electric "Sound-Rated" installation every time. And for additional assistance, contact your local General Electric Apparatus Sales Office—because when it comes to ballasts, it *pays* to specify General Electric sound-rated ballasts.

Progress Is Our Most Important Product

GENERAL  ELECTRIC



SEND FOR YOUR SOUND RATING CALCULATOR

Send check for one dollar with your name and address to:
**General Electric Company,
Section D401-31, Schenectady
5, N. Y.** Your Sound Rating
Calculator will be sent to you
by return mail.

On the spot application engineering assistance is also available. Nearly 100 ballast application engineers located throughout the United States stand ready to assist you. They are as close to you as your telephone.

SPECIFY QUALITY...

insist on MCGILL®

The toughest industrial sockets made —

McGill LEVOLIER phenolic and brass sockets have the quality needed to withstand the hard use and abuse of industrial service. Important to you is the saving these sockets offer by eliminating frequent replacement of ordinary sockets.

They are built heavier to last longer with .006" heavier screw shells, double thick molded phenolic casings and the famous LEVOLIER switch mechanism. 660 watt, 250 volt with push button, molded lever or universal pull lever control.

No. 4403-PB single circuit, 660 watt, 250 volt socket with $\frac{3}{8}$ " cap and shade threads. Double thick impact resisting cap and casing of molded phenolic screws together for easy wiring and assembly. Molded lever and push button adaptation of LEVOLIER switch mechanism. Perfectly insulated with no exposed metal.



No. 4403-FL single circuit, 660 watt, 250 volt socket. LEVOLIER switch mechanism with molded lever control. $\frac{3}{8}$ " cap, shade threads. This and 4403-PB especially adaptable to machine lighting.



No. 4303-PL single circuit, 660 watt, 250 volt socket. Molded phenolic case with $\frac{3}{8}$ " cap. Molded phenolic case without shade threads. Plain brass lever.



No. 4100 single circuit, 660 watt, 250 volt brass socket with $\frac{1}{8}$ " cap and casing that screws together with a locking collar and prevents accidentally snapping the sections apart. Universal pull lever and chain.



No. 4120-PB two circuit, 250 watt, 250 volt for two filament bulbs. Sequence of operation is High, Medium, Low and Off. $\frac{1}{8}$ " cap. Push button control. Available in molded phenolic also.



Ample space above mechanism permits tying Underwriters' knot.

Extra heavy shell of impact resisting molded phenolic

Special alloy of high conductivity bronze for switch contacts.

Convenient side terminals avoid uneven wire lengths.

Upper and lower halves screw together for easy assembly.

Shell completely insulated with no exposed metal.

Red plastic button to actuate new push type mechanism.

Mechanism rigidly supported in shell.

Approved by Underwriters' Laboratories Incorporated.

Lamp base screw shell .006" heavier than standard.

FREE! For complete information on McGill sockets, lampguards, switches and other electrical specialties, write for catalog 84.

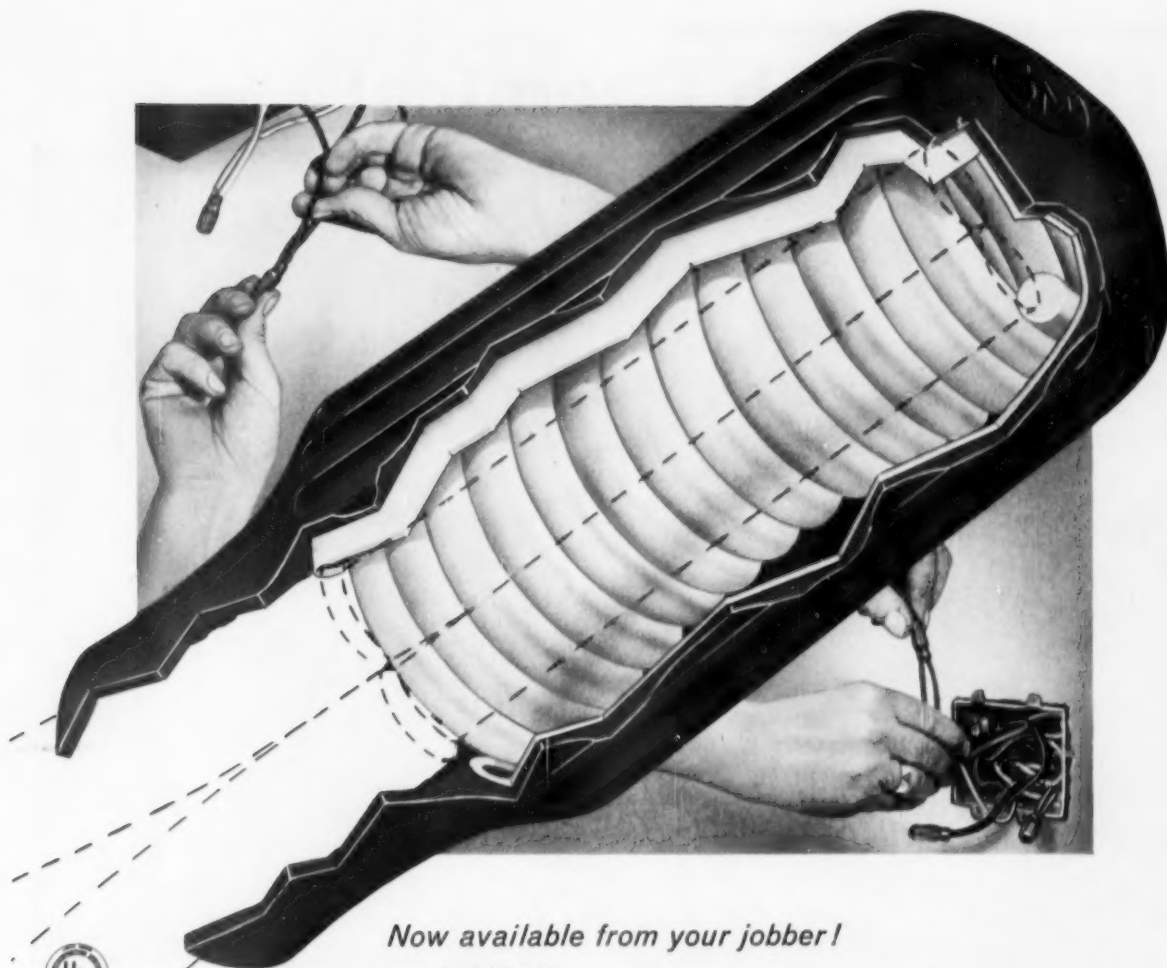


MCGILL®
ELECTRICAL SPECIALTIES

are always a little better
and **ALL** are Underwriters
Laboratories Inspected

McGILL MANUFACTURING COMPANY, INC.

450 N. Campbell St., Valparaiso, Indiana



Now available from your jobber!

Reg. U.S. Pat. Off.

SCOTCHLOK Type R

BRAND

Electrical Spring Connectors

With "live" Spring Action!

The "live" spring action of new "SCOTCHLOK" Type R Connectors holds wires in a bulldog grip. The *feel* of turning on a "SCOTCHLOK" is a sound test of its holding power. Here's everything you need for a one-step pig-tail: positive, vibration-proof connection; reinforcing steel shell; tough, pre-insulated vinyl cover; and a neat, compact splice.

**FEEL
THE GRIP!
TRY TO
PULL
THEM OFF!**



Send For Free Samples! See for yourself how good "SCOTCHLOK" Brand Type R Connectors really are! Just write on your letterhead and we'll send you free samples for testing.
Address: 3M Company, St. Paul 6, Minn., Dept. CB-27

The term "SCOTCHLOK" is a registered trademark of Minnesota Mining and Manufacturing Co., St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N. Y. In Canada: P. O. Box 757, London, Ontario.



Another new development using

B.F. Goodrich Chemical raw materials



This new telephone distribution wiring with insulation of Geon polyvinyl materials is manufactured by Whitney-Blake Company, New Haven, Connecticut.

He has the right number for new phones

THIS new telephone distribution wire, using copper conductors insulated with Geon polyvinyl materials, is cutting "hook-up" costs for new service as much as 50%.

One of the advantages of this new wire, in addition to the lower installed cost, is the ease with which the installer can tap into the color-coded wires anywhere along the line. This distribution wire permits telephone companies to supply almost immediate service in urban development areas, and the wire can be re-used after the installation of permanent cable plant.

This new development is practical because of Geon polyvinyl chloride's superior electrical properties, excellent resistance to abrasion and weathering. Even total immersion in water or oil for years won't break down Geon materials. As a result, Geon is the recognized leader in plastic insulating materials.

You can use the remarkable properties of Geon polyvinyl materials in many totally different products . . . rigid piping or flexible wall covering, foam padding or coatings for paper, textiles, or metal. For information write Dept. D11, B. F. Goodrich

Chemical Company, 3135 Euclid Ave., Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



B.F. Goodrich Chemical Company
a division of The B.F. Goodrich Company



GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

Another NEW BLACKHAWK



aluminum

"1-bite bender!"

NOW! Make 90° bends in 1½" through 3" pipe in one pass

It's another Blackhawk exclusive! No other bender on the market can match the performance of Blackhawk's featherweight S-139 ALUMINUM Bender. It's a super-portable 103 lbs. ready for work! Makes 90° bends in ½" to 3" pipe in one pass! Only 3 quick settings needed for 3½" and 4" bends.

User's records prove Blackhawks with electric-powered hydraulic pumps pay for themselves in only 35 bends — save up to 75% on cost of manufactured bends.

Get a truly modern "featherweight" from the complete line of preferred Blackhawk Benders . . . for ½" — 2" thin-wall conduit and 1" — 4" rigid conduit and pipe — at your electrical or industrial supply house.

New 3" and 4" featherweight benders

FOR BENDING UP TO 3" PIPE
S-139 assortment with electric-powered hydraulic pump — or S-138 assortment with hydraulic hand pump. Both for 1½, 1½, 2, 2½, and 3" diameters.

FOR BENDING UP TO 4" PIPE
Model S-140 assortment with electric-powered hydraulic pump. For 1½, 1½, 2, 2½, 3, 3½ and 4" diameters.

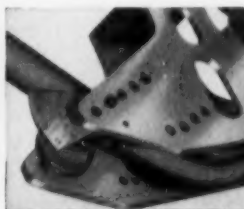
FOR BENDING UP TO 4" PIPE
S-137 assortment with P-85 hydraulic hand pump . . . for 1½, 1½, 2, 2½, 3, 3½ and 4" diameters.



Exclusive work-saving BLACKHAWK features



REMOVABLE TOP PLATE . . . "LOCK-ON" SHOES — No threading of shoes on ram — simply place them in position and insert lock pin. Pipe is quickly positioned from above rather than "muscle-in" from side. Top-plate has snap-action, quick-lock bolt.



"OPTIK-ANGLE" GAUGE — Stops guesswork and time-wasting measuring in controlling degree of bend. The exact angle of bend is constantly in view. Gauge is mounted right on bender.



WHOPPING 77% SAVED ON BENDS! Dietz Electric Co. project foreman says, "on our last job we saved more than \$2,000.00 compared to cost of manufactured elbows. Blackhawk S-139 will be our production bender from now on."

Aluminum Alloy Frame and Shoes . . . Strength with Light Weight!

Rigid and Strong — yet surprisingly light weight — means greater portability, easier assembly on bench, floor, makes overhead bending a cinch. Smooth action S-139 turns out uniform factory-like bends — makes big savings in time and materials compared to manufactured bends. The new Blackhawk is by far the easiest to use . . . fastest bender on the market today. Keeps electrician crews happy too!

CALL YOUR ELECTRICAL OR INDUSTRIAL SUPPLY HOUSE TODAY!

BLACKHAWK bends prove BLACKHAWK'S best!

BLACKHAWK

BLACKHAWK MFG. CO., DEPT. P-2027, MILWAUKEE 46, WISCONSIN



"Porto-Power"



Hydraulic Pipe Benders



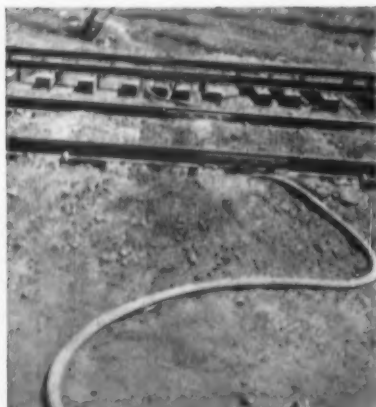
Hydraulic Knock-Out Punches



Hydraulic Jacks thru 100-tons



Over-all view of mine. Each ore car in foreground contains about 60 tons of ore.



Tracks are constantly being moved as pit enlarges. Cables are moved with the tracks.



Cables lie in the sun or rain without any protection. They don't need any.



Shovel, being moved, carries 5000 feet of cable with it in the steel box.



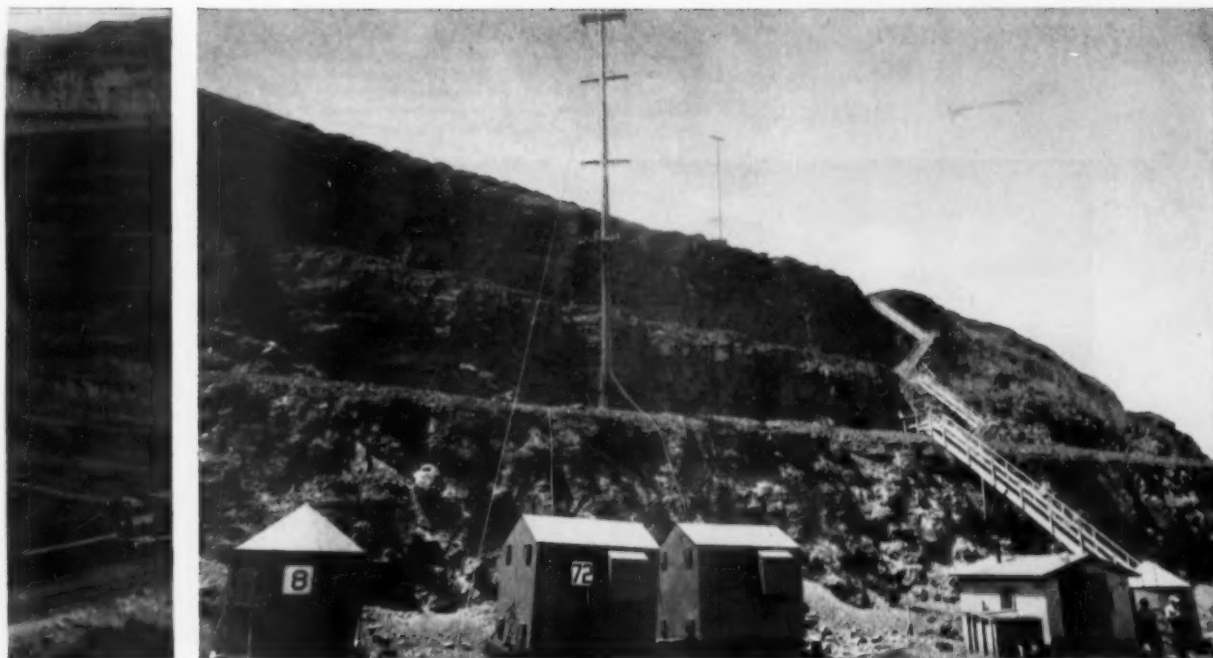
Workman manhandles the cable trailing a churn drill as it heads for new location.



Notice long span of this cable bridge and extreme flexibility of cable in foreground.



Shovels lift up to 18 tons in one bite; they operate 24 hours a day.



Entrance poles and meter houses. Cables start from here, work at 440 or 4000 volts.

Iron ore mine finds Tiger Brand Amerclad *in use since 1928*

THE PICTURES show one of the greatest open pit iron ore mines in the world. From pole-head to meter house to shovels and drills, Tiger Brand Amerclad electrical cable serves as a flexible nerve system to supply the huge electrical requirements of machines that operate 24 hours a day in temperatures that range from 100° in the shade to minus 40° in the shoulder-deep snow.

Some of this cable has been in use since 1928, and it's still good.

Other cable is right in the blast area, where it is dragged over sharp rocks and pounded by dynamite-propelled boulders. Even this cable averages six to eight years of useful life.

Look at the pictures and read the captions that tell about operating conditions. You'll see why *no* heavy-duty electrical cable has a greater reputation than Tiger Brand Amerclad. Call your American Steel & Wire representative for the whole story.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS TIGER BRAND ELECTRICAL WIRE & CABLE

*A STANDARD TIGER BRAND CABLE FOR
EVERY SPECIAL JOB*

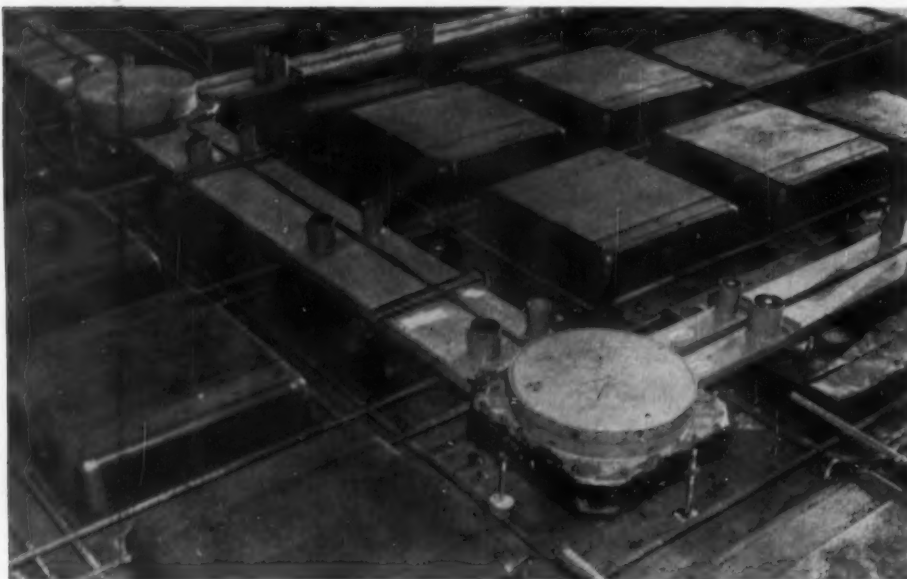


- asbestos wire and cable
- mold cured portable cord
- shovel & dredge cable
- paper & lead cable
- aerial, underground and submarine cable
- varnished cambric cable
- interlocked armor cable
- special purpose wire & cable

UNITED STATES STEEL



Pictured here is one of the first installations of a Walker No. 224 Combination Duct System. Building owner and General Contractor is the Standard Construction Co., 1000 Connecticut Ave., Washington, D. C. Electrical Contractor: Metropolitan Electric Co., Falls Church, Va. Electrical Engineers: General Engineering Associates, Washington, D. C. Electrical Distributor: Doubleday-Hill Electric Co.



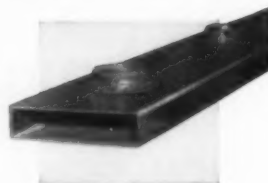
Walker Announces New Large Capacity Combination Duct Systems

To meet today's increased use of telephone, intercom and signal service—and to provide room for future expansion—Walker has developed large capacity Combination Duct Systems. These systems use Walker No. 4 Duct in combination with Walker No. 2 Duct to afford the following range of wiring capacities:

CATALOG NUMBER	DESCRIPTION	TOTAL CROSS-SECTIONAL AREA
System #224	One No. 2 and One No. 4 Duct	12.0 sq. in.
System #3242	One No. 4 and Two No. 2 Ducts	15.3 sq. in.
System #3424	One No. 2 and Two No. 4 Ducts	20.8 sq. in.

NUMBER OF CONDUCTORS PERMITTED IN WALKER NO. 2 AND NO. 4 DUCT BY NATIONAL ELECTRICAL CODE		
WIRE TYPES: T, TW, RU, RUH, RUW		
CONDUCTOR SIZE (AWG)	NUMBER OF CONDUCTORS IN NO. 2 DUCT	NUMBER OF CONDUCTORS IN NO. 4 DUCT
14	96	259
12	75	204
10	58	156
8	31	86
6	15	42
4	11	32
2	9	24
1	6	17
1/0	5	15

Walker No. 4 Duct has 8.75 sq. in. cross-sectional area compared to 3.31 sq. in. for No. 2 duct. No. 4 duct measures 6 1/2" x 1 1/2" and is doubly protected against corrosion.



Walker No. 224 Junction Box accommodates one No. 2 and one No. 4 duct. Straight passageway affords easy pulling of cable.



WALKER BROTHERS Conshohocken, Pa.

Underfloor Electrical Distribution Systems
Rigid Steel Conduit—E.M.T.—Wire and Cable

*"Quality Our Tradition,
Progress Our Ambition"*

walker
of Conshohocken



LIGHT ENGINEERING IS SIGHT ENGINEERING

**AT
GUTH**

one of the many results:

GRATELITE*
Louver-Diffuser



TRUSTED name in lighting since 1902

THE EDWIN F. GUTH COMPANY

ST. LOUIS 3, MISSOURI

*©U. S. Pat. No. 2,745,001
Canadian Patent Pending

Specify Red "D" Portable Cord

with "built-in"...

PM



Diamond Type MD* heavy, medium and light duty flexible cordage...rubber insulated with rubber or neoprene jacket.

Maximum flexibility, moisture resistant. Conveniently marked-to-measure!



Diamond DTX* Non-Metallic WHITE Sheathed Cable. Non-sticking, smooth and easy to pull. Clean to handle, does not flake off!

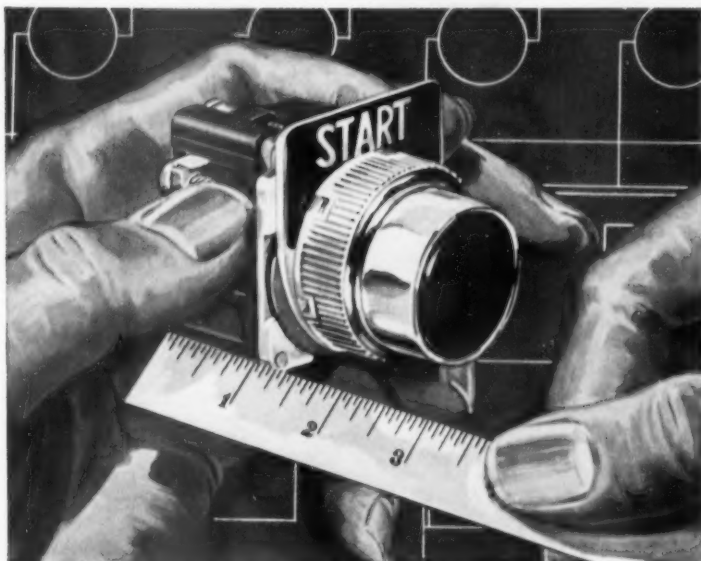


PREVENTIVE MAINTENANCE gets top priority from industrial management... so when the job calls for an industrial application of Portable Cord, specify the product with "built-in" PM! Diamond Portable Cord and Red-D-Prene® assure the industrial user maximum protection against costly downtime caused by cord failures. The tough, oil and abrasion resistant sheaths give long wear, reduce maintenance costs. Red-D-Prene, first portable cord produced in Industrial Red, is readily identified... thus minimizing accidents.



DIAMOND
WIRE and CABLE Company
Sycamore, Illinois

Machine designers say these new heavy duty pushbutton units have no equal and prove it by adopting them as standard equipment

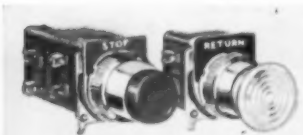


These are the world's smallest heavy duty pushbuttons. They require a behind-the-panel depth of only 1 3/32". This is 40% less space than needed by the next smallest units on the market. Double-pole contact blocks are available in all combinations of normally open and normally

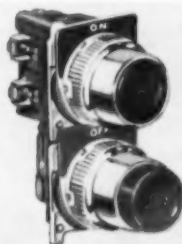
closed contacts. Each control circuit is electrically and mechanically isolated from the other. Each circuit is clearly identified and all terminals are color coded. Rapid on-the-job circuit additions are obtained by stacking contact block on contact block.

- ☆ they install easier
- ☆ they work better
- ☆ they last longer

Design engineers are quick to recognize that these new heavy duty pushbuttons have everything. There is nothing on the market like them. They are amazingly compact to require the least back-of-panel depth. They are one-hole mounting and they are oil tight. They easily provide for as many as eight separate control circuits per pushbutton, eight completely isolated heavy duty contacts either normally open or normally closed. The buttons may be flush type, the extended type or with mushroom heads. They can be black, red, yellow, green or gray. See the new one-button control station, C-H Roto-Push. See the easiest-to-install maintained-contact pushbutton attachment and the means for padlocking any of the standard pushbuttons. There are both knob and key operated selector switches in this complete line. Also matching indicating lights and the new automation safety light, PresTest. Be sure you have complete information now. Write today on your company letterhead for a copy of the new Cutler-Hammer Pushbutton Handbook Pub. EL-178. CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wisconsin.



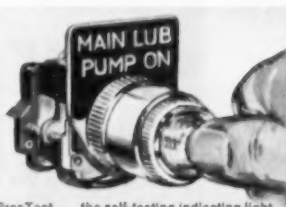
These pushbuttons may be flush type, extended type or with mushroom heads... in a wide range of colors for quick control identification. Standard, large, and jumbo size legend plates fit every type of operator and indicating light in the entire line.



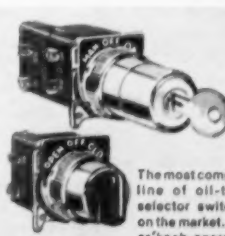
A maintained-contact pushbutton assembly that saves more than its entire cost by installation savings. New attachment with its pushbuttons mount in minutes; no fussy adjustments. Neither alignment nor spacing of units is critical. Pushbuttons will not bind or stick; always operate perfectly.



The C-H one-hole mounting oil-tight indicating lights with new wide-visibility lenses are the most visible from all angles by actual light meter tests. Available in either transformer or resistor types. Lenses offered in six different colors.



PresTest... the self-testing indicating light. Vital to safety and proper use of machines, particularly in automation. PresTest now permits instant proof light is NOT off because of burned-out bulb. Merely pressing on the light lens disconnects bulb from its normal circuit and checks it on a test power supply. Resistor and transformer types available.



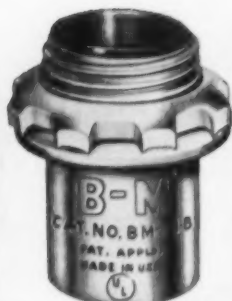
The most complete line of oil-tight selector switches on the market. Key or knob operated; two or three position. Positions may maintain contact or have spring return. Three standard contact blocks provide a wide range of circuit combinations with the use of just a single block. Unlimited circuitry by adding blocks.



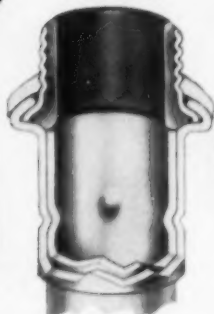
Roto-Push... the one-button control station. One Roto-Push can provide all the control functions for which two or three separate pushbuttons would be used normally. Available in a wide range of selector and button operators, Roto-Push simplifies panel design and saves installation time to cut costs. Improves machine-operator efficiency.

B-M

the original
concrete-tight
**INDENTER
FITTINGS**
for E.M.T.



**Red Throat
Insulated
Connector**



**Red Throat
Cross section**



"BM" #100
Cutter for 1/2, 3/4
and 1" E.M.T.



"BM" #1000
Holder for 1/2, 3/4
and 1" E.M.T.



"BM" #607
1/2" Indenter

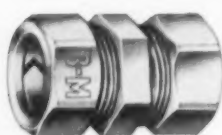


"BM" #600
Changeable Jaw Indenter

Briegel Rain-Tight E.M.T. Compression Fittings



SIZES FROM
1/2" to 2"



SIZES FROM
1/2" to 2"



SIZES
1/2", 3/4", 1"



SIZES
1/2", 3/4", 1", 1 1/4"

Briegel Representatives from Coast to Coast

J. H. Akerman
813 Sistina Avenue
Coral Gables 46, Florida
Phone: Mahawk 7-3864

Harry C. Andrews Co.
5440 Gravois Avenue
St. Louis 16, Missouri
Phone: Hudson 1-7373

Crescent Electric Sales Co.
1800 N. Humboldt Blvd.
Chicago 47, Illinois
Phone: Albany 2-2600

R. L. Cunningham Electric Co.
843 South Front Street
Philadelphia 47, Pennsylvania
Phone: Lombard 3-3660 & 3-3109

L. J. Crews
1725 Arlington Road
Richmond 20, Virginia
Phone: 4-2273

Curtis Sales Corporation
3231 Warrenville Center Rd.
Shaker Heights 22, Ohio
Phone: Skyline 2-0223

Herbert L. Jones
745 Ohio River Blvd.
Pittsburgh 2, Pennsylvania
Phone: Linden 1-6684

Al Levin & Associates, Inc.
1200 So. Peters Street
New Orleans, Louisiana
Phone: Tulane 8480 & 8489

H. A. Maggione & Son
15 Carleton Street
Cambridge 42, Mass.
Phone: Kirkland 7-4954

Ernst F. Nauch Co.
1282 Folsom Street
San Francisco 3, California
Phone: Hemlock 1-1828

R. C. Handy Sales Co.
4811 Excelsior Blvd.
Minneapolis, Minnesota
Phone: Walnut 6-2939

L. D. Hood Sales
1133 West 8th Avenue
Denver, Colorado
Phone: Acoma 2-8001

A. Leo Clifford
1801 West 18th
Indianapolis 7, Indiana
Phone: Melrose 6-4449

Walter S. Nash
2101 Tula Street, N.W.
Atlanta, Georgia
Phone: Elgin 8071

Rutkin Electrical Sales Co.
935 Stanford Avenue
Los Angeles 21, California
Phone: Tucker 1224 & 5

Valkus-Kissel
1711 Kelly Street
Dallas 1, Texas
Phone: Hamilton 8-7388

W. W. Wheat & Son
2219 4th Avenue
Seattle 1, Washington
Phone: Seneca 6222

Arnold J. Young Co.
12600 Hamilton Avenue
Highland Park 3, Michigan
Phone: Townsend 9-5080 & 1

E. J. Martin Company
150 Nassau Street
New York 38, New York
Phone: Worth 4-6270

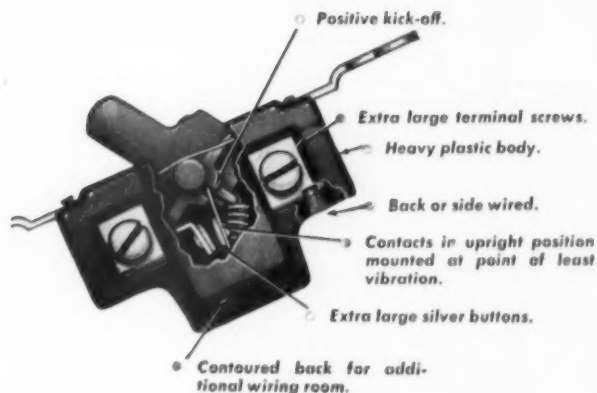
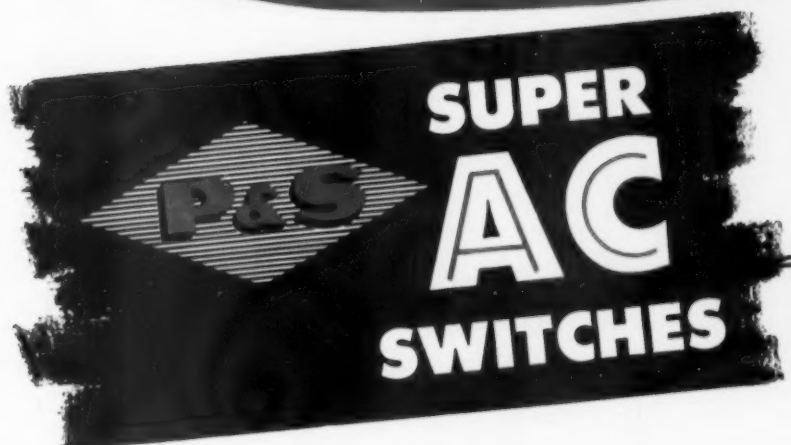


All B-M Indenter Fittings are U.L. Approved as concrete-tight and all Compression Fittings as rain-tight as well as for general use (File Card E10843). Also comply With Federal Specifications W-F-406.

BRIEGEL **METHOD
TOOL
CO.**
GALVA, • ILLINOIS

SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

BUILT TO TAKE A BEATING



Made to surpass the most rigid requirements of specification wiring jobs, P&S Super AC Switches can't be matched for durability, dependability and versatility of application. Use them AT FULL RATED CAPACITY for tungsten filament lamp loads, fluorescent installations, and at 80% of the switch rating on motor loads—the highest rating the National Electrical Code permits. Heavy silver-alloy contacts keep temperature rise at a minimum . . . a P&S Super Switch will handle full amperage 24-hours-a-day, seven-days-a-week.

The extra-heavy plastic body is designed to take more punishment than you could possibly give it. Its unique construction makes it virtually noiseless in operation. Totally enclosed, it can be mounted in any position. Write today for full information, including the report of the Underwriters' Laboratory Tests, to Dept. ECM-23.



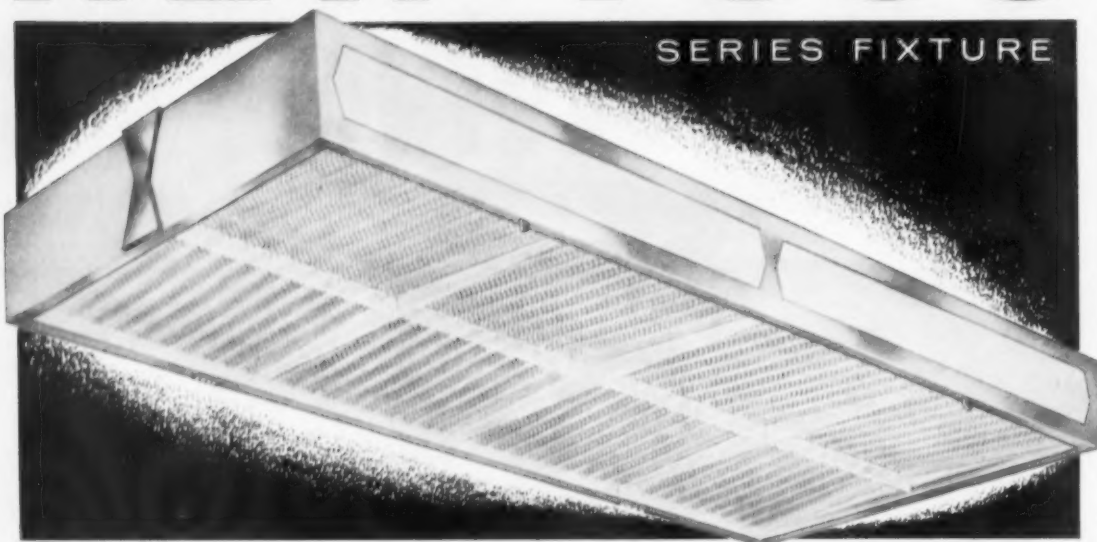
PASS & SEYMOUR, INC.

SYRACUSE 9, NEW YORK

60 E. 42nd St., New York 17, N. Y. 1229 W. Washington Blvd., Chicago 7, Ill.

In Canada: Renfrew Elec. & Refrig. Co., Ltd., Renfrew, Ontario

Meet Litecontrol's NEW 7300



*... Modern lighting at its
Problem-Solving Best with
Holophane's New, Revolutionary
Acrylic Lens*

Yes, here is modern surface lighting at its best for modern stores and offices. Why? Because here is an attractive fixture which utilizes the Holophane No. 6024 Controlens* — the lens that has broken the glare barrier. This lens, extremely high in efficiency while low in brightness, permits the use of high lighting levels without the glare discomfort heretofore unavoidable with high footcandle installations. What's more, the fixture is sturdy, light-in-weight and economical . . . first cost and maintenance are appealing to any budget. If you have a lighting problem, this is the type of standard fixture that can solve it for you. Available with 2, 4, or 6-40 watt rapid start lamps — length 49¾ inches, height 4¾ inches.

QUICK FACTS

- **TYPE** — Surface hinged acrylic lens fixture
- **HOUSING** — Die-Formed, all welded. Made of at least 20 Gauge Electroplated Zinc Coated Steel, for Rust Prevention and Bonderized for paint adherence.
- **HINGED DOOR** — Easy to open and close with Trigger Catch. 16 gauge die formed steel, welded throughout.
- **SIDE PANELS** — Translucent plastic
- **FINISH** — Baked white enamel
- **KNOCKOUTS and HOLES** in top for easy mounting



*Also New! Litecontrol
8300 Series
for Recessed Mounting*

Like the 7300 Series, the 8300 may be easily used to advantage individually or in rows in stores, offices, auditoriums, banks and elsewhere. It is designed for recessed mounting in plaster or T-Bar ceiling (will not snap in). Not for inverted Tee grid ceilings (for which other designs will be available). 2, 3, 4 or 6-40 watt rapid start lamps. Holophane No. 6025 CONTROLENS*. Hinged door is removable, opens from either side, Trigger Catch. Length 48 inches, height 7 inches. Other construction details similar to 7300 Series.

*Registered T.M.


LITECONTROL
Fixtures


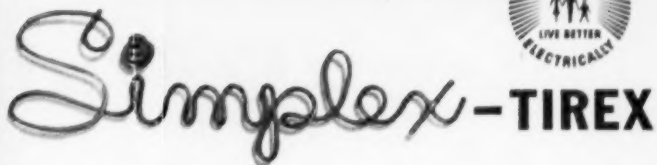


KEEP UPKEEP DOWN
LITECONTROL CORPORATION
36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

The Burning Question . . .

of how to attain better welding efficiency is answered by the new, improved flexibility of SIMPLEX TIREX WELDING CABLES. These expertly designed cables are easier to work with, easier to handle. Their jacket of cured-in-lead Neoprene Armor is the toughest known — engineered against damage by abrasion, oil, heat and water. Be sure — specify TIREX WELDING CABLES. Order from your distributor; or for complete data, write for Booklet 1011.

SIMPLEX WIRE & CABLE CO.,
79 Sidney St., Cambridge 39, Mass.



MICRO SWITCH . . . FIRST IN PRECISION SWITCHING



How plant operators use MICRO SWITCH Precision Switches to speed materials handling

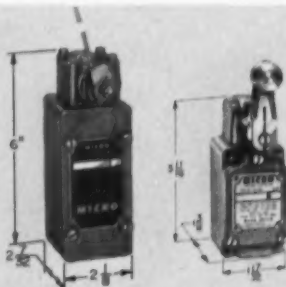
Plant engineers find MICRO SWITCH precision switches ideal for keeping production lines running smoothly.

Small in size, high in electrical capacity, versatile in application, these switches may be used everywhere—in process, bulk, flow and level controls; on package and part con-

veyors; in counting and weighing devices; as manual push-button controls; and to automatically control mechanical motion of machines and equipment.

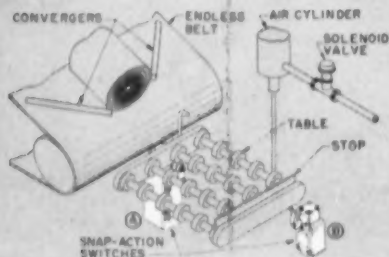
Here are two practical examples of the way these switches have been used to speed materials handling:

Automatically unload tied bundles



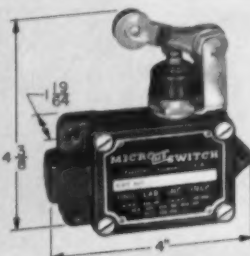
Two MICRO SWITCH precision switches, of different types, unload tied bundles from this conveyor. They also prevent bundles from piling up at the end of the conveyor.

Bundles, which come from the floor above, are centered by two convergers. Each bundle actuates Switch A (with long feeler) as it passes on to the ball bearing table. The switch operates a timing device which stops the conveyor and operates a solenoid air cylinder. This tilts the table, dropping the bundle into a hand truck below. When the table returns to normal position, it actuates small limit Switch B which starts the conveyor again.



There is a MICRO SWITCH Distributor near you with complete stocks of switches for plant use applications. Look under "Switches, Electric" in your classified telephone directory.

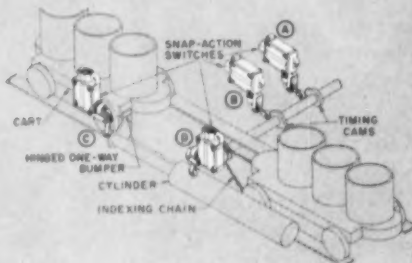
Four switches position moving carts on conveyors



On the forward stroke of a hydraulic cylinder ram the carts are moved forward by a hinged one-way bumper.

The switch circuit ties the hydraulic cycle in with the mechanical timing cycle and prevents the next loading operation until the cylinder ram has moved the preceding carts ahead on the conveyor.

Switch C closes on the forward stroke of the ram. A timing cam closes Switch A. This reverses the hydraulic ram to the back position where it closes Switch D. When Switch B is closed by the timing cam, the ram again moves out and pushes the carts forward on the conveyor.



Are you reading
MICRO Tips?
Send for this live
"how others do it"
publication today.



MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS





Luminaires of Du Pont LUCITE manufactured by The Miller Company, Meriden, Connecticut, use 1' x 4' low brightness lenses injection-molded by Prolon Plastics Division of the Pre-phy-lac-tic Brush Company, Florence, Massachusetts. Known as "The Hartford," these luminaires illuminate the new district headquarters building of the Virginia Electric and Power Company, Norfolk.

Better looking, better lighting

with luminaires of Du Pont LUCITE®

The Virginia Electric and Power Company, which provides electric service to a large part of the state of Virginia, recently constructed a modern division headquarters building in Norfolk, Virginia, in which 77% of the lighting fixtures are of Du Pont LUCITE.

Lenses made of crystal-clear LUCITE acrylic resin refract light efficiently and evenly . . . transmit optimum light without specular glare or shadow. They are strong, durable, free from discoloration and dimensionally stable. In addition, lenses made of LUCITE are shatterproof, light in weight, easy to handle and install.

Because of these outstanding features, LUCITE is being utilized in practically all types of modern lighting installations: modular light-diffusing panels, large-area lighting, low-brightness lenses for troffer and pendant luminaires, side panels, cove lighting enclosures, and protective covers for outdoor lighting fixtures.

Why not evaluate the advantages of incorporating LUCITE into your lighting designs? For property and application data send for booklet at right.

SEND FOR FREE BOOKLET.

This 12-page, illustrated booklet describes the latest property and application data on LUCITE acrylic resin for lighting. For your free copy, write to E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 492, Du Pont Building, Wilmington 98, Del.



BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

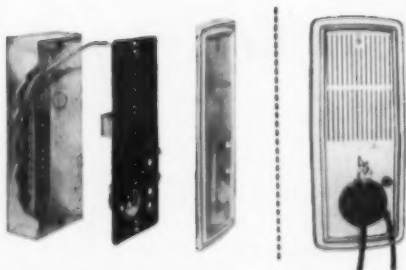
NEW... most beautiful Apartment Telephones ever made!



- Equipped with cordless loudspeaker or watchcase receiver—your choice
- Modern, slim, streamlined design
- Aluminum face plate with beautiful anodized finish in brushed gold or silver
- Plug-and-receptacle installation
- Easiest telephone in the world to install and maintain
- Excellent voice reproduction
- Competitive price
- Pleasant-sounding audible signal
- Flush, semi-flush or surface wall mounting

Auth vestibule and lobby telephones also have been re-designed and are the last word in appearance and efficiency. Get complete facts today.

Apartment and vestibule telephones illustrated are cordless loudspeaking type. Also available are apartment telephones with watchcase receiver as indicated.



Exploded view of cordless loudspeaking telephone

Watchcase receiver type



ELECTRICAL SIGNALING,
TIME AND COMMUNICATION
SYSTEMS FOR HOSPITALS,
SCHOOLS, HOUSING,
INDUSTRY AND SHIPS

Auth Electric Company, Inc.

LONG ISLAND CITY 1, NEW YORK



ANDERSON ELECTRIC

Anderson Electric's exclusive Vers-a-groove T-Connectors feature 3-piece design for easy installation . . . 8-bolt construction for controlled clamping pressures and greater contact length . . . reversible clamp for increased cable range and wider application.

ANDERSON ELECTRIC CORPORATION
Birmingham 1, Alabama

Aluminum & Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATIONS • TRANSMISSION • DISTRIBUTION

TCCB SERIES



versatile...

Familiar symbols of safety

PROTECTION ON THE RAILS

FOR YOUR WIRING PROTECTION

Standard-threaded rigid steel conduit is the **only** wiring system approved today by the National Electrical Code as moisture-, vapor-, dust- and explosion-proof for use in hazardous locations and occupancies.

Permanently safe wiring systems today demand the use of Youngstown Buckeye full-weight rigid steel conduit for positive protection from damaging elements such as water, moisture, vapor, dust and dirt. It's been the accepted standard of architects, contractors and owners who have found over the years its higher quality and longer service life spell increased profits and less trouble on-the-job.

Users across the nation consistently report Buckeye Conduit is easy to fabricate—easy to fish wires through—and guarantees trouble-free installations because of its excellent corrosion resistance.

Leading distributors in every industrial and electrical market are ready to serve you quickly from their ample stocks. They're as near as your phone—why not call now?

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yaloy Steel

General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities



Ask your distributor for
Youngstown Buckeye Full
Weight Rigid Steel Conduit
and
Youngstown Electrical
Metallic Tubing.



POOR SUBSTITUTE

FOR GOOD LIGHTING

The green eye shade . . . it used to be standard equipment for the skilled machinist, toolmaker and precision assembler. It was his sole defense against the painful glare conditions found throughout industry until a very few years ago . . . and still found in an alarming number of plants even today.

Wonderful things happen when the need for the green eye shade is eliminated by modern lighting planned to give good "seeing"—for greater efficiency, accuracy and comfort. Case after case proves that production goes up, rejects go down, absenteeism and industrial accidents are greatly reduced.

Quality industrial lighting . . . and re-lighting . . . very quickly pays for itself. May we demonstrate the facts? Call in your electrical contractor and your Miller representative!

MILLER RLM INDUSTRIALS

Miller industrials, "Crown" and "Imperial", meet and exceed the newest standards for quality plant lighting. They provide greater light output, increased upward light, better shielding, more efficient reflection factors. Improved structural details mean longer life, lower maintenance and quicker installation. Write for bulletin.



*Better Lighting
for a Brighter America*



THE MILLER COMPANY • GENERAL OFFICES: MERIDEN, CONN. • FACTORIES: UTICA, OHIO and MERIDEN, CONN. • IN CANADA: CURTIS LIGHTING OF CANADA LTD., TORONTO

METARAY® ELEMENTS

Now any infrared reflector bank can be equipped with glassless, gloreless, self cleaning Metaray elements. Radiation is uniformly spread in a figure 8 pattern.

Ask for Bulletin L-1104-A



MODULAR RADIANT PANELS

A high-intensity, accelerating heat source. Four standard, modular panels completely factory assembled with built-in continuous bus, reflector, insulation, frame and mounting. Lets you tailor heat source exactly to process requirements.

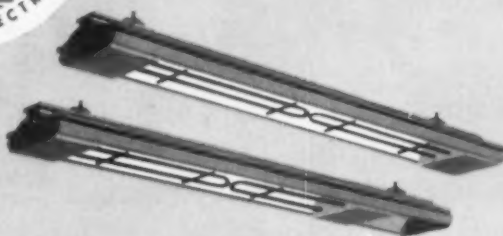
Ask for Bulletin CS-606



RADIANT HEATERS

For assembly in banks. Two bolts to hold it; two wires to connect it. Six standard lengths, 14 standard wattages. Housing is rigid extruded aluminum with brightly polished parabolic non-oxidizing reflector.

Ask for Bulletin CS-604



ADJUSTABLE AREA RADIANT HEATERS

The new Chromalox URAD lets you match heat source to the work area. Choose one basic housing for your largest work. Into the housing you install any of 6 different heated lengths as your present work requires.

Ask for Bulletin CS-607

4 ways to put Far-infrared to work!

When you want reduced processing time, more uniform pre-heating, curing or pre-drying, or increased heating capacity on existing equipment, put Chromalox Far-infrared on the job! The long wavelength makes the difference.

With small capital investment, flexible Far-infrared goes to work on the most difficult heat problems. Output is infinitely variable from 4 to 100% of capacity. Chromalox Far-infrared covers the work in a uniform pattern, unmatched by other heat sources.

You never worry about breakage to spoil work in process. The Chromalox metal-sheathed generator is industry's most durable Far-infrared heat source. Nothing to shatter, break. Impervious to hard knocks, steam or splashed liquids.

Contact your Chromalox representative for helpful information on Far-infrared for your application.

Edwin L. Wiegand Company

7637 Thomas Boulevard, Pittsburgh 8, Pa. ■ 702

the **O.Z. SHURELUG**

has more of the features
you want...



**O.Z. means
more for you**

The O. Z. ShureLug is the newest addition to the complete O. Z. line of electrical fittings; more proof of O. Z.'s policy to make available dependable products at realistic prices.

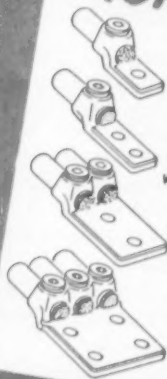


MORE SIZES

The new O. Z. ShureLug is available for a wide range of sizes, including "in between" sizes usually found only in more expensive makes. This means that whether the job calls for #14 sol. or 1000 MCM cable, there will be an O. Z. ShureLug that will meet your needs more closely, more exactly, for a more secure, more dependable connection.



MORE MODELS



Here's variety too!: O. Z. ShureLug is available in single barrel, double barrel, and triple barrel models... with socket heads or hex heads... in single hole, double hole, and four hole styles, depending upon sizes selected. Here again, premium selection at practical prices!

MORE ECONOMY

O. Z. ShureLugs are priced no higher than other competitive brands, but you get so much more! Because O. Z. ShureLug is made in more sizes, more models, you buy only the capacity you actually need... only the capacity that you'll actually use. Why spend more for over-sized lugs when O. Z. has the size you want, the model you need, at the low economical prices you want to pay?



O.Z.

ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

Sales Office and Warehouse: 406 So. Cicero Avenue, Chicago 44, Ill. • Esterbrook 9-0326
Office and Factory: 749 Bryant Street, San Francisco 7, Calif. • GARfield 1-7846

CAST IRON BOXES
CABLE TERMINATORS
POWER CONNECTORS
SOLDERLESS CONNECTORS
GROUNDING DEVICES
CONDUIT FITTINGS



"CORDON" CIRCUIT BREAKERS

Widely accepted for high fault protection on low voltage applications

...4 frame sizes available for immediate delivery



Conceived and engineered at I-T-E. Recognizing the need for a practical and economical means to adequately protect low-voltage distribution circuits where very high fault currents are encountered, I-T-E engineers conceived and developed the first completely integrated current-limiting molded case circuit breaker. Named the "Cordon", this compact circuit breaker has an interrupting rating of 100,000 rms amperes.



Manufactured and tested by I-T-E. The "Cordon" combines all the design and operating advantages of standard I-T-E molded case circuit breakers with the proven high interrupting ability of current limiting Amp-Traps.* A prototype of this was developed, tested and retested until it met the rigid I-T-E standards. Then, and only then, was a complete line offered to industry. Four frame sizes are now available.

*Amp-Trap: T.M. Reg. The Chase-Shawmut Co.

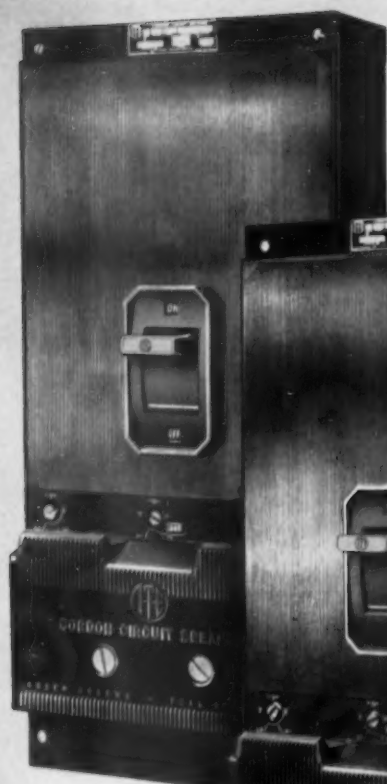


Widespread acceptance. Now thousands of delivered "Cordon" circuit breakers prove industries' acceptance of this device and confirm I-T-E's belief in the need for it. More and more "Cordon" circuit breakers are being specified as the practical, economical answer for low voltage, high fault applications.

Learn more about this new concept in circuit protection. Contact the I-T-E sales office nearest you, or write for Bulletin 5042A.

I-T-E CIRCUIT BREAKER COMPANY • Small Air Circuit Breaker Division

19th & Hamilton Sts., Philadelphia 30, Pa.



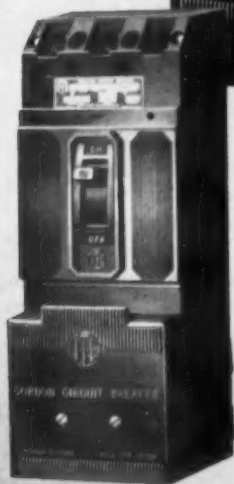
225 amp CK frame



400 amp CKL frame



600 amp CL frame

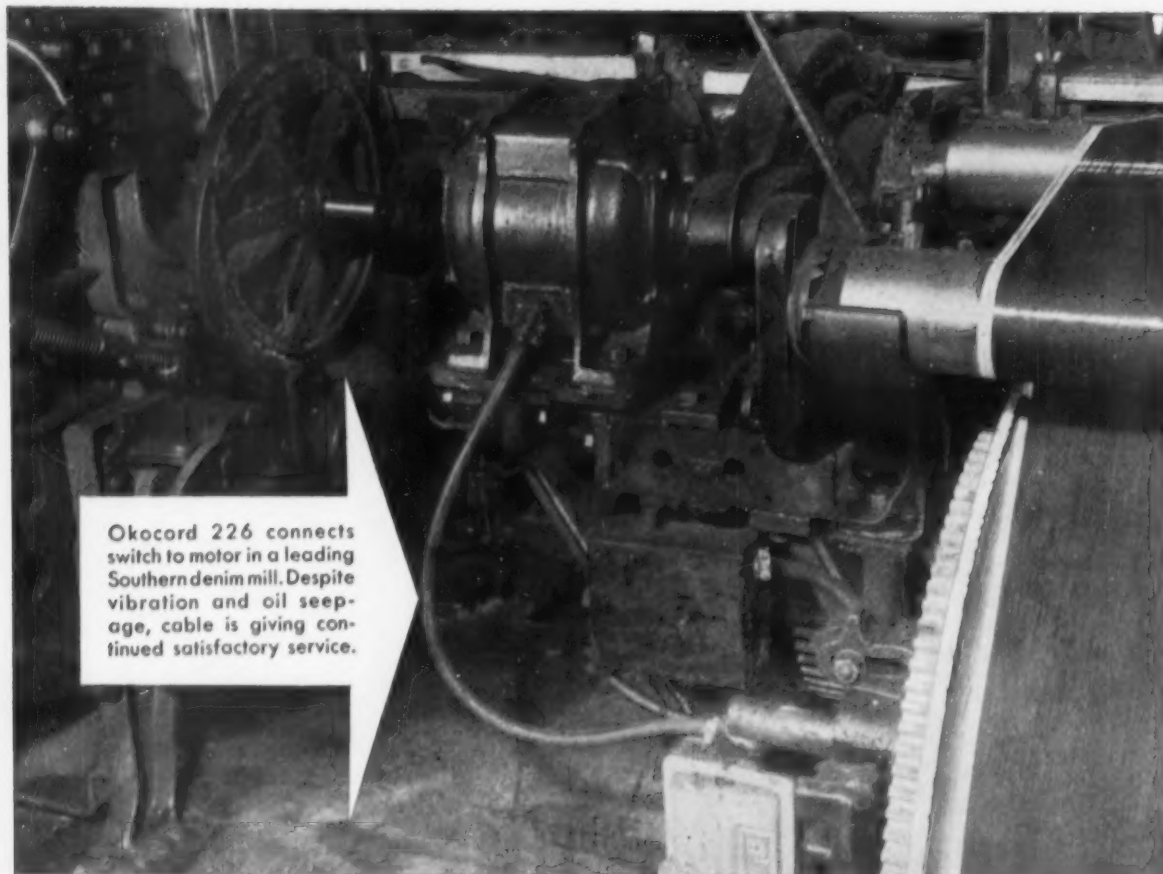


100 amp CF frame

Engineers are now specifying these I-T-E Current-Limiting "Cordon" Circuit Breakers.

Immediate delivery can be made on all four frame sizes, for 600 v a-c and 250 v d-c service, 15 to 600 amperes.





Okocord 226 connects switch to motor in a leading Southern denim mill. Despite vibration and oil seepage, cable is giving continued satisfactory service.

new Okocord* motor lead design solves oil seepage problem

Excess oil in loom motor bearings—a common weave room problem—is a real troublemaker for motor leads. It is a *hidden* danger since the oil seeps into the cable and deteriorates the conductor insulation inside the jacket.

Okonite engineers investigated the problem and came up with Okocord 226. This new construction offers a conductor insulation that's just as oil-resistant as the jacket. Inside and out, this cable is safe from deterioration due to oil seepage.

A year's operation on a motor intentionally over-oiled proved this oil resistance.

Since then it has been proved again and again by actual mill operation in many plants.

The picture above shows an early installation of Okocord 226 in a leading Southern denim mill. Operating in typical weave room conditions, the cable is still giving satisfactory service with no signs of deterioration that causes trouble.

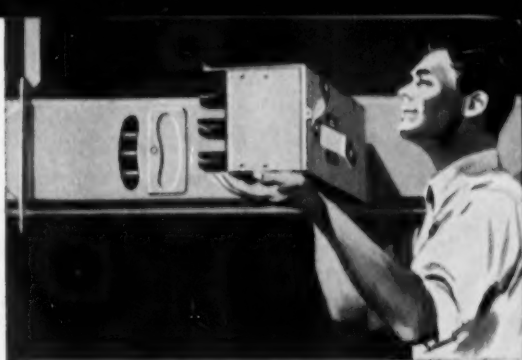
This is just one more example of an Okocord construction designed to solve an unusual installation problem. For a cable designed with your problems in mind, write The Okonite Company, Passaic, New Jersey.



* This product formerly carried the trade name Hazacord

where there's electrical power . . . there's **OKONITE CABLE**

3550-A



Standardized plugs are inserted easily, securely and safely at conveniently spaced plug-in openings—one plug-in opening to every foot of duct. Reinforced fingers insure positive pressure contact. Seven types of plugs are available.



Your Bulldog field engineer will be most happy to give you complete details on Plug-in Duct, Lo-X[®] Duct and the many other Bulldog products. You'll find his electrical know-how and product knowledge most helpful when you plan installations.

Sell flexible plug-in power—profit many ways!

Stepped-up production and plant expansion invariably demand extra power. A profitable way for you to provide this is to install Bulldog Plug-in Duct[®].

It's the *original* flexible power system—proved in thousands of installations. It's as easy to sell as it is to install. The duct comes in standardized 10' sections . . . features a scarf-lap construction that supplies rigidity without splice plates . . . simplifies hanging. Also, bus bars overlap at the joints, giving bolt-tight contacts in a hurry without special adjusting.

Earn good will, repeat business, substantial profits. Recommend and install Bulldog Plug-in Duct and other Bulldog products.

© BEPCO

Bulldog Electric Products Company, Detroit 32, Michigan • A Division of I-T-E Circuit Breaker Company • Export Division: 13 East 40th St., New York 16, New York. In Canada: Bulldog Electric Products Company (Canada), Ltd., 80 Clayson Rd., Toronto 15, Ontario.



IF IT'S NEW . . . IF IT'S DIFFERENT . . . IF IT'S BETTER . . . IT'S

BULLDOG

ELECTRIC PRODUCTS COMPANY

ELECTRICAL CONTRACTORS! When you're going after new construction business, you need more than the right bait — You need to know where to drop your line...



We help you pick the right pond

Just looking anywhere is a costly way to find business—the best, economical way is to be at the right place at the right time. If you want to know what jobs are coming up and when, then mail this coupon today.

TO: **DODGE REPORTS**, 119 WEST 40th STREET, DEPT. 90, NEW YORK 18, N. Y.

Yes! I'd like to pin-point my prospects by knowing in advance who's going to build, what, when, where.

I want to know whom to contact and when to submit bids.

I'd like to see some Dodge Reports and I'd like a copy of your booklet that tells how to use this accurate, daily, up-to-the-minute construction news service.

I understand that I can pick just the area and type of construction activity that interests me. Also, that I won't have to wade through mounds of data to find the information I need.

I'm interested in General Building ☐ House Construction ☐ Engineering (Heavy Construction) ☐

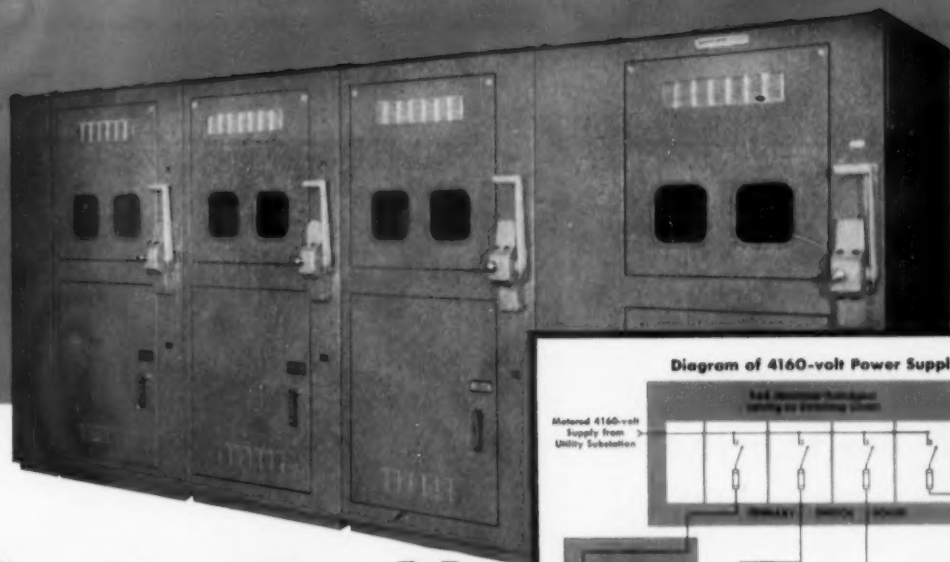
in the Following Area: _____

NAME _____

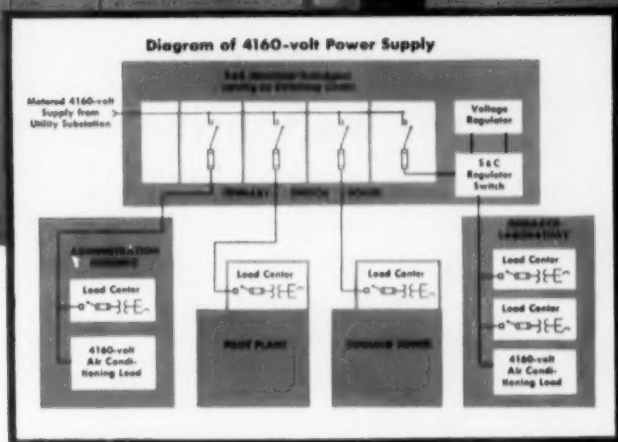
ADDRESS _____

CITY _____ ZONE _____ STATE _____





Why Pay Double for Metalclad Switchgear for your High-Voltage Power Supply



CHARLES E. VANA,

electrical engineer with E. R. Gritschke & Associates, personally supervised the design of Universal Oil Products Co.'s electrical system, and selected the components.



HIGH-voltage power supply systems in typical industrial and commercial installations are almost never exposed to transient faults. For that reason they can use the simple radial form of power distribution, and dispense with high-priced metalclad switchgear designed for automatic reclosure on faults. Reliable interruption of the infrequent permanent fault and occasional switching is all that is required.

When a new research laboratory building was added to the Universal Oil Products Co. plant in Des Plaines, Ill., a complete new high-voltage power supply system was installed for the entire plant. The S&C Metalclad Switchgear shown above serves as the 5-unit switching center. The diagram shows how it fits ideally into the simple radial circuit, thus eliminating the cost of complex equipment.

E. R. Gritschke & Associates, consulting engineers for the installation, recommended S&C Metalclad Switchgear for the switching center, to provide "completely adequate switching facilities and dependable protection." Architects for the job were Olsen & Urbain; the electrical contractor was Fries-Walters Company.



Specialists in High-Voltage Switchgear for Electric Utilities since 1910

S&C ELECTRIC COMPANY

4433 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U.S.A.

Consult your telephone directory. Sales offices in Birmingham, Boston, Buffalo, Chicago, Cleveland, Columbia (S. C.), Dallas, Dearborn, Denver, Houston, Huntington, Indianapolis, Jersey City, Kansas City, Little Rock, Memphis, Minneapolis, New Orleans, Philadelphia, Phoenix, Pittsburgh, Portland (Ore.), St. Louis, St. Petersburg, Salt Lake City, San Francisco, San Gabriel, (Los Angeles), Seattle, Syracuse, Washington, D. C. In Canada: S&C Electric Canada Ltd., 8 Vansco Road, Toronto 14, Ontario.

NEW

circuit breaker plug-in for switchboard mounting

• ANOTHER ADVANCED DESIGN FROM WESTINGHOUSE •



To install: (1) just plug in the breaker, and (2) fasten four bolts. It's that simple. For maintenance inspection or rating exchange, reverse the procedure.

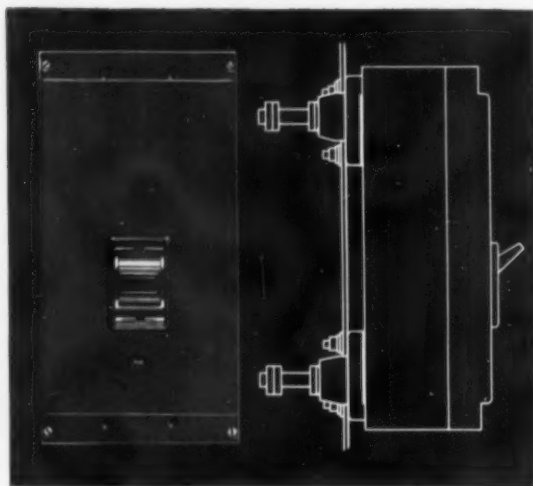


YOU CAN BE SURE...IF IT'S

Westinghouse

• ANOTHER ADVANCED DESIGN FROM WESTINGHOUSE • ANOTHER ADVANCED DESIGN FROM WESTINGHOUSE •

ADVANCED DESIGN FROM WESTINGHOUSE • ANOTHER ADVANCED DESIGN FROM WESTINGHOUSE • ANOTHER ADVANCED DESIGN FROM WESTINGHOUSE •



• ANOTHER ADVANCED DESIGN FROM WESTINGHOUSE •

You can't minimize the importance of safeguarding your men on the job. Now from Westinghouse you can have that protection in a standard AB breaker with new drawout terminals designed not only for safety but for ease of handling.

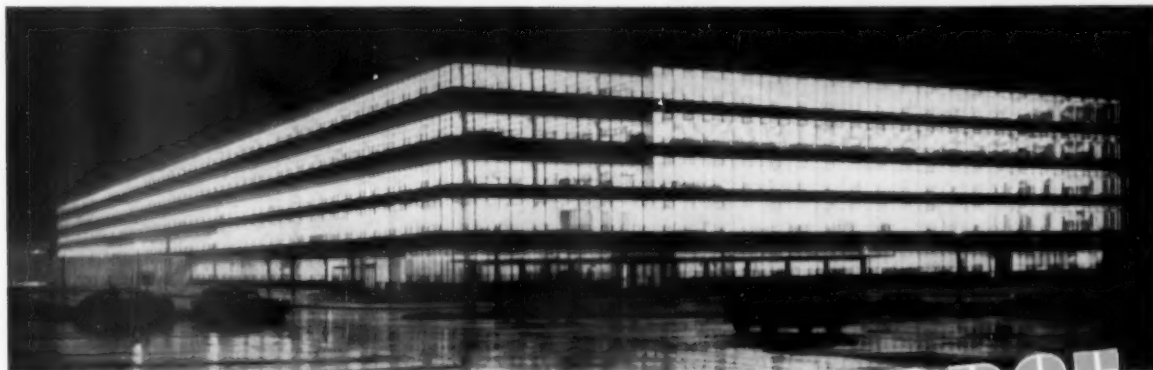
This is another new product of Westinghouse research and development. Another advanced design from Westinghouse.

There are no live bolts or nuts to remove. And hot switchboard terminals are shielded... even when breakers have been removed. No projections hazard electricians; the position of studs and tulip connectors has been reversed. This new design also prevents damage from falling hardware or tools.

Westinghouse offers a complete AB breaker line, including kits of plug-in parts. You'll find all the facts in Westinghouse Booklets DB 29-150 and PL 29-120. To get your copies, write to Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania.

J-30247

New Home for Army Service Records



WIRE BY PHELPS DODGE

This modern AG Record Center building* in St. Louis, Mo., is virtually an oversized glass filing cabinet. Housed here are service records of 20,000,000 persons who have served in the Army or Air Force since the Civil War.

A dependable wiring system was an important part of the building's specifications. That's why Phelps Dodge wire and cable was installed.

On every wiring job, where top-quality materials, expert workmanship and experienced "know-how" are called for, *it pays to rely on Phelps Dodge and your Phelps Dodge distributor!*

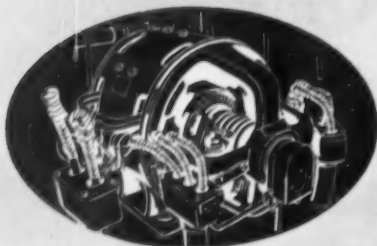
*Joint General Contractors: Fruin-Colnon Contracting Co., St. Louis, Mo., and Peter Kiewit Sons' Co., Omaha, Neb.,
Electrical Contractor: Mack Electric Co., St. Louis, Mo.



**PHELPS DODGE COPPER PRODUCTS
CORPORATION**

SALES OFFICES: Atlanta, Birmingham, Ala., Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Greensboro, N. C., Houston, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N. Y., San Francisco, St. Louis, Seattle, Washington, D. C.

DUTCH BRAND Plastic Electrical Tape



MAINTENANCE

Oil and dirt proof.
Provides neat, positive
insulation for all high
voltage motor leads.

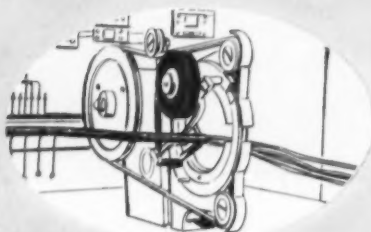


efficient, low cost insulation for the manufacture



PRODUCTION

Conforms to provide a
safe, strong insulating
seal in wiring harness.



and maintenance of electrical equipment



CONSTRUCTION

The perfect insulation
for splices and terminals
in junction boxes.



VERSATILE—Dutch Brand Plastic Electrical Tape offers maximum versatility and performance . . . especially where space is limited . . . it stretches 150% . . . conforms to irregular surfaces.

DURABLE—resists galvanic corrosives, rot, mildew, fungus, severest weather, and is not affected by water, oil, grease, acids or alkalies.

ECONOMICAL—the variety of sizes and widths available permit maximum tape economy for each job. Dutch Brand polyvinyl Plastic Electrical Tape .007" thick for general use; .010" thick tape for heavy duty protection and for use with power driven taping machines; and .020" thick tape for extra heavy duty where abrasion and wear are met.

Call your Dutch Brand Man for a demonstration!

Tool Up with Dutch Brand Tape!

. . . and "Big Four in Electrical Tapes" tells you how. This new booklet is loaded with money-saving ideas. Write today!



Johns-Manville
DUTCH BRAND
PRODUCTS

7800 WOODLAWN AVENUE • CHICAGO 19, ILL.

Modernization at 277/480

Higher voltage distribution and utilization, typically 277/480 volts, 3-phase, 4-wire, for larger new commercial buildings is now fairly well established in many big cities. When loads exceed a few hundred kilowatts, there are often potential cost advantages over 120/208-volt systems. Experience has been generally favorable. The disadvantages, higher voltage to ground and the isolated systems required for serving plug receptacles and conventional equipment at 120 volts, have proved to be readily amenable to good design, workmanship and careful selection of materials, equipment and methods.

Electrical modernization of existing buildings often present new system requirements comparable in scope and cost with new construction. Potential cost advantages of higher distribution voltages are sometimes even more impressive. Yet, the higher voltage system is rarely installed in this class of work and it is doubtful whether, on most prospective jobs, it is even fully explored.

In other times, the natural conservatism which slows the adoption of new methods or systems would be of little importance long-range. Systems of conventional voltage work just as well and can be designed for equal utility. But at this moment in industry history events are "breaking" and decisions have to be made which affect not only present opportunity but future prospects as well.

Air conditioning of commercial buildings in some cities is no longer optional. Researchers have discovered that when 18% of available office space in a community has summer cooling, the remaining existing buildings **must** provide it for their tenants. Our three largest cities are at or over the mark now. While we talk about electrical modernization, air conditioning dominantly occupies the first attention of building managements.

Electrical requirements for air conditioning are, of course, extensive, complicated and costly. But electrical work is often a sub-contract under a prime contract concerned only with adequate energy supply to the air conditioning apparatus, and such electrical work is not necessarily designed for or coordinated with other existing and prospective load requirements of the building.

Higher voltage distribution may be a way around the problem. Its application requires, inherently, the services of engineers and contractors especially competent in modern electrical distribution system design and installation. It requires, inherently, consideration for the existing and future load requirements of the building. It offers also the prospect of attractive economies which could make the difference between air conditioning now with further electrical improvements long deferred or complete electrical system modernization fully coordinated with the air conditioning installation.

Wm. T. Stuart



Production rates rise and employee relations improve with adequate ventilation . . . from Graybar.



The most complete selection of lighting units and G-E lamps available . . . from Graybar.



Modern tools speed the work on production lines or in the shop. Select, and order . . . from Graybar.



Planned power distribution . . . for flexibility in meeting present and future power needs . . . from Graybar.

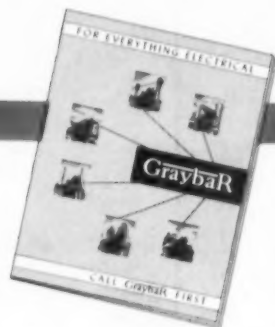
For anything electrical . . . call Graybar first

Always call Graybar for anything and everything electrical. Through Graybar you and your customers have available over 100,000 electrical items, locally or through a nationwide network of warehouses. Ready to help you on any problem concerning lighting, ventilation, electronics and communication are Graybar Specialists.

The Graybar representative who calls on you, and Graybar "inside" personnel who back him up, can provide accurate catalog and quotation information on products of the world's leading manufacturers in every field of electricity. Further, Graybar is completely owned by its operating and retired personnel. Thus every Graybar man you deal with is vitally interested in seeing that your electrical needs are well and promptly served.

Next time you or your customers need anything electrical, large or small — rely on Graybar.

76-42



Send for a copy of "For Everything Electrical", a 28 page 2 color brochure which tells in digest form how Graybar's nationwide facilities are geared to serve every electrical need.

CALL **GraybaR**

FIRST FOR



GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK, IN OVER 130 PRINCIPAL CITIES



UNDER CONSTRUCTION view of plant shows main outdoor substation in center and H-frame line carrying overhead supply feeders, at left.

Modern high-voltage distribution backs . . .

POWER FOR A TEXAS PLANT

Indoor and outdoor electrical distribution—at four different voltage levels—is a firm base for the modern electrical system designed by the engineering division of Continental Electrical Construction Co. of Chicago, Ill., for the valve manufacturing plant of W. K. M. division of A. C. F. Industries, Stafford, Texas. Installation was a co-venture of Continental Electrical Construction Co. and Seiders Electric Co., Houston, Texas.

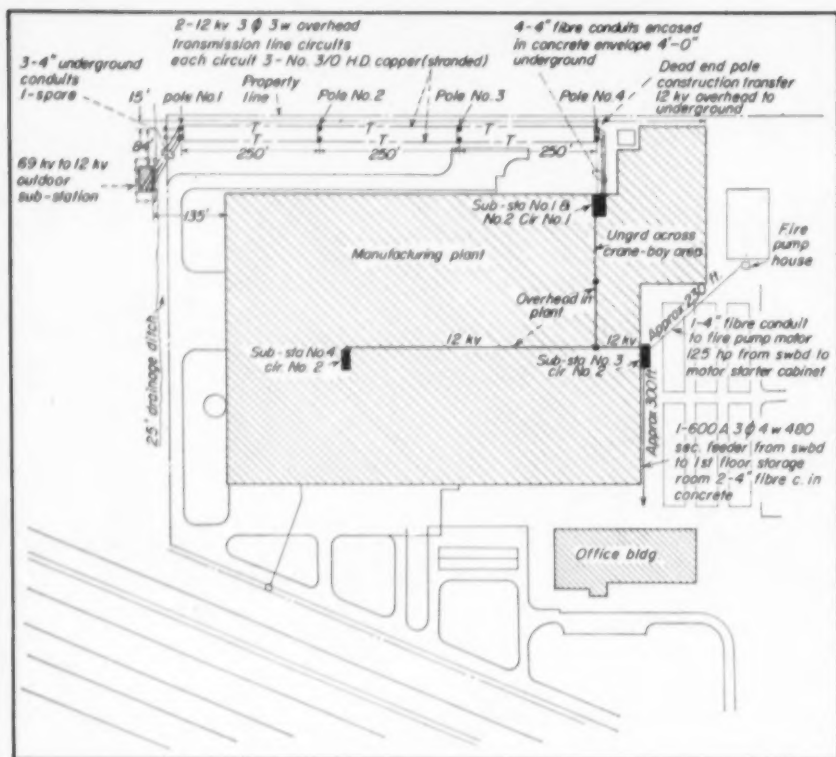
By J. F. McPartland

MODERN design and skilful construction combine to make an outstanding industrial electrical system in the plant of the W. K. M. division of A. C. F. Industries, Stafford, Texas, just outside of Houston. Here, the latest design concepts provide a highly efficient and flexible distribution system to serve an unusually wide variety of light and power loads and heating and air conditioning

equipment. Involving indoor and outdoor construction, the system is based on bulk power distribution to load-centers, using a high-voltage level and two low-voltage levels. A detailed, step-by-step analysis of the overall system clearly points up the advantages of the various design methods. The illustrations show the high order of workmanship involved in the installation.

Power supply to the plant is

made by the utility over a 69-kv, 3-phase, 3-wire overhead line to a main outdoor substation tower structure on the plant property. Strain insulators and clamps for dead-ending this line were supplied as part of the substation structure. Construction of the outdoor main substation and extension of a pole line to carry power into the manufacturing plant were done by Line Erectors division of Electrical Con-



PLOT PLAN of manufacturing building and office building shows general plan of 12-kv distribution to major load centers.

structors, Inc., Houston, Texas.

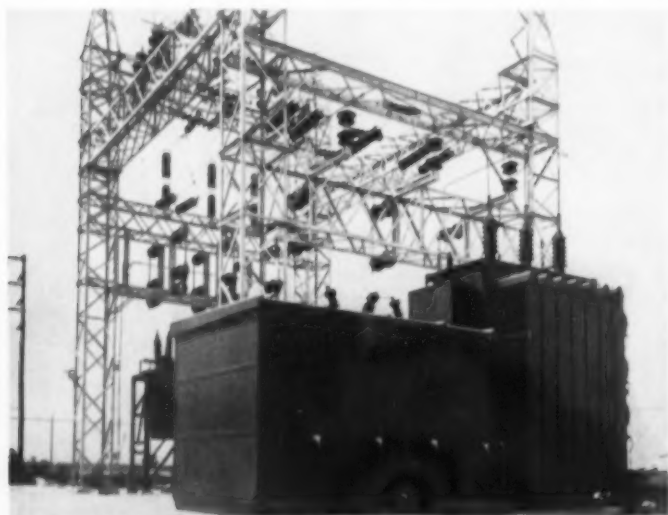
The main substation consists of a steel structure with insulators, switches, clamps and lightning arresters, 69-kv oil circuit breakers for the incoming line, a 7500-kva transformer stepping the power

from 69 kv to 12 kv, and 12-kv switchgear equipment. The 69-kv side of the transformer is equipped with current and potential transformers and metering equipment supplied by the utility. The steel structure is equipped with light-

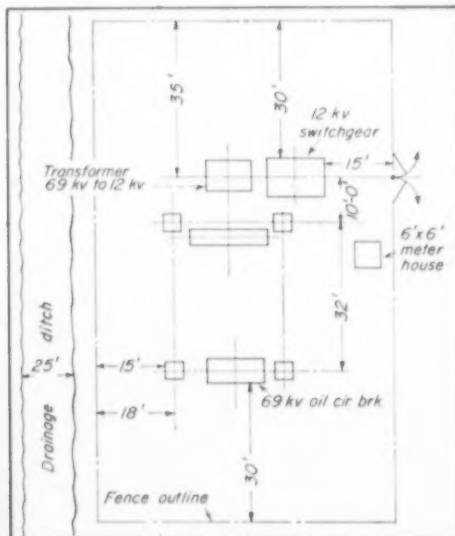
ning rods and is grounded by a grounding network. Outdoor lighting is also provided for the substation.

On the 12-kv side, the substation transformer is connected into a 12-kv switchgear assembly alongside the transformer. This assembly consists of four compartments—two auxiliary and two 12-kv drawout-type air circuit breakers. From each of the 12-kv compartments, a set of secondary feeder conductors is carried in 4-in. fibre duct encased in a concrete envelope and run 4 ft below grade to the base of a nearby (about 100 ft) "H" pole structure. A spare 4-in. fibre duct run, with both ends capped and water-tight, was also installed to provide for possible future use.

The 12-kv feeders from the switchgear are carried up the nearby H-frame construction using fibre-duct-to-conduit adapters to extend the service conduits up the poles. One conduit carrying one set of feeder conductors is carried up each of the two poles making up the H-frame. The spare fibre duct run is capped at the base of the H-frame. From this first H-frame, the two 12-kv overhead circuits are carried over two more H-frames to a fourth H-frame, as shown in the plot plan. This H-frame is adjacent to the main plant switchgear room, and the two 12-kv circuits are carried down the poles of the frame in conduit, into fibre duct and then underground to



MAIN SUBSTATION is an outdoor steel structure—carrying insulators, disconnect switches and lightning arresters for the incoming 69-kv supply line, transformer and circuit protective, switching and metering equipment. Secondary high-voltage switchgear and main transformer are shown in foreground in photo. Layout of equipment is shown in diagram.



the plant switchgear room. These service conduits are bonded and connected to the ground wire of the pole.

Inside Distribution

Within the switchgear room, the two 12-kv circuits terminate in a primary selector switch mounted on the inside wall of the room. One of the 12-kv circuits supplies unit substations 1 and 2 in the switchgear room. The other 12-kv circuit is extended underground and then overhead, within the plant, to supply substations 3 and 4. Substation 3 is an outdoor unit, located just outside the building wall adjoining the parking lot. Each of the substations is a double ended unit, containing two 1000-kva transformers stepping the power from 12,000 volts to 480/277 volts, 3-phase, 4-wire, wye. Secondary switchgear in the subs is as follows:

Sub 1—two 1000A, four 600A, 3-P CB's

Sub 2—two 1000A, four 600A, 3-P CB's

Sub 3—seven 600A, 3-P CB's

Sub 4—six 600A, 3-P CB's

The details of distribution are shown in accompanying illustrations. The main 12-kv feeder ex-

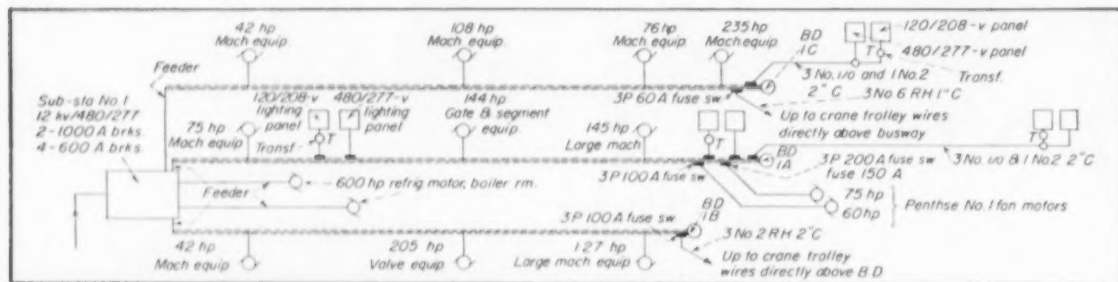
tending from the switchgear room to subs 3 and 4 is carried underground in a trench and concrete envelope where it crosses the crane bay area. Secondary feeders from the four unit substations terminate in busway runs, with the exception of the two feeders to the two 600-hp refrigeration compressors and the

feeder to power panel 4. These secondary feeder runs are made in galvanized rigid conduit, carried overhead and supported on trapeze hangers.

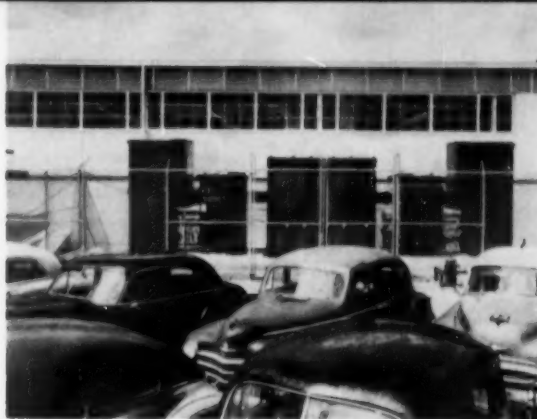
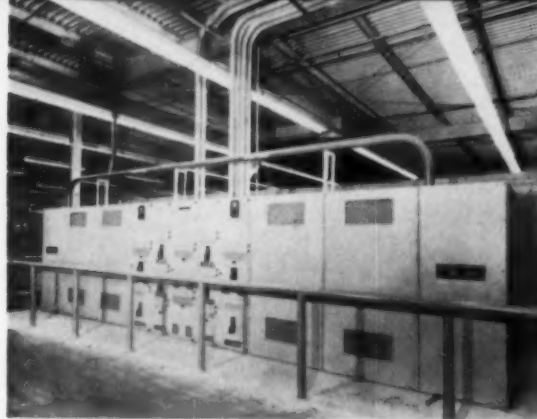
Power panels used throughout are of the dead-front, fused switch type, with lugs only for main connections to 480-volt, 3-phase, 3-wire feeders. Branch circuits in these



SWITCHGEAR ROOM in plant is on outside building wall close to dead-end pole location at end of feeder overhead line. View here is between unit power centers 1 and 2, showing primary selector switch on outside wall, at rear of photo, with incoming and outgoing circuits.



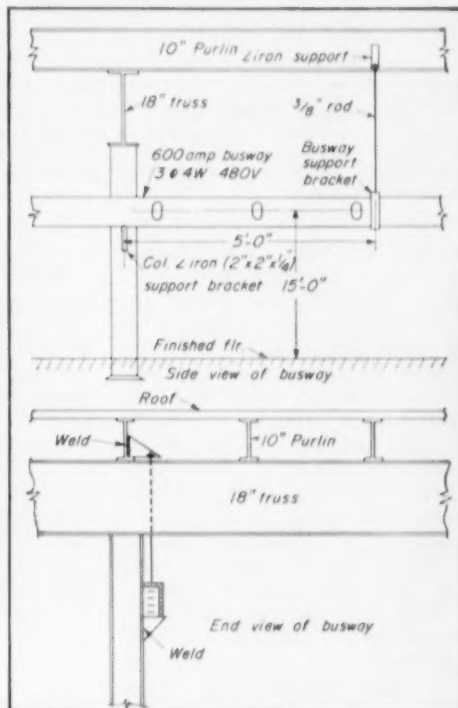
PLUG-IN BUSWAY provides general electrical distribution throughout the plant. In photo, busway is shown mounted on steel columns down center of high bay area, with taps provided to lighting panels and machines as required. Diagram shows typical bus distribution loads on one of unit power centers. Motor symbols shown indicate group hp loads for departments served from that busway, with exception of penthouse motors.



UNIT POWER CENTERS 3 (right) and 4 are supplied by single 12-kv feeder. Single feeder runs from selector switch in switch-gear room to center of plant where splice is made to run to both of widely separated power centers. Both subs are 2000-kva double-ended centers. Center 4 is supplied from overhead conduit run, at left. Center 3 is fed underground.

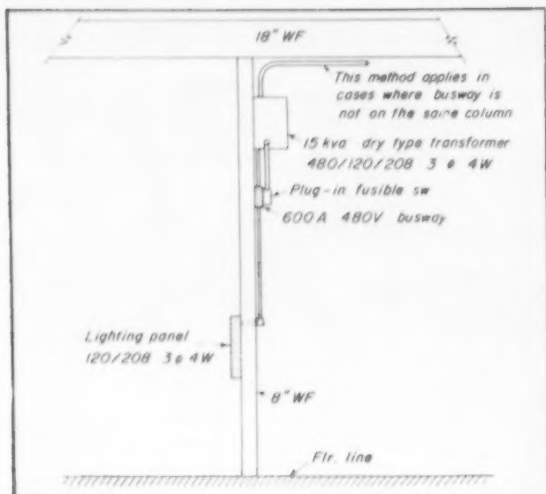


LOW-BAY AREAS are served by plug-in busway mounted on steel columns as shown in diagram at right. Busway runs supply motors, power panels and lighting panels—at 480/277 volts directly and 120/208 volts through dry-type transformers.



Bus duct	Total hp	40 % div.	95 % Eff.	Kw	Kva 80 %	Kvar 80 %	Kva 95 %	Kvar 95 %	Kvar diff.	Kvar use
1 A	364	146	153	109	136	82	115	35	47	45
1 B	374	150	157	117	142	85	124	38.4	46.6	45
1 C	461	185	194	145	181	109	153	47	106	105
2 A	735	(30%) 220	230	172	215	130	181	56	74	75
2 B	1300	(30%) 390	410	306	382	230	322	100	130	135
3 A	729	291	307	229	183	110	218	67	43	45
3 B	275	110	116	87	69	41.5	83	25.6	16	15
3 C	532	213	225	168	134	80	160	49.5	30.5	30
3 D	356	143	151	113	90	54	108	33.4	20.6	30
4 A	532	213	225	168	134	80	160	49.5	30.5	30
4 B	520	208	219	163	130	78	155	48	30	30
4 C	320	128	135	100	80	48	95	29.4	18.6	30

PF CORRECTION on busway runs is provided by 575-volt, 15-kvar capacitors mounted on busway in kvar capacities necessary to provide average correction in accordance with above table.



DRY-TYPE TRANSFORMERS used to supply 120/208-volt, 3-phase, 4-wire panels from busway feeders are mounted in this general manner, with slight variation where single-feeder from busway switch serves both 120/208-volt panel and 480/277-volt panel.

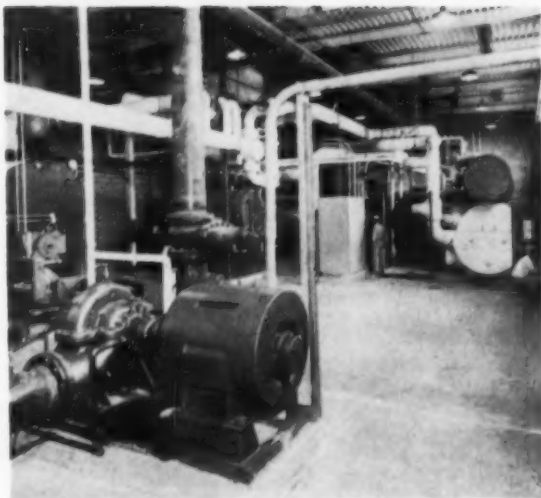
panels are 3-pole, of the fusible switch type. Lighting panels rated 480/277 volts, 3-phase, 4-wire, are of the circuit breaker type. Lighting panels supplied at 120/208 volts, 3-phase, 4-wire, are also CB panels. The 120/208-volt panels are supplied through dry-type transformers with primary ratings of 480 volts, 3-phase, 3-wire. These transformers are non-explosive, fire-resisting type, cooled by natural circulation of air. They are mounted on columns in the plant and have their secondary neutrals grounded to their cases, providing a system ground for the 120/208-volt loads.

Subfeeders to panelboards are made from busway taps. They originate from plug-in fusible switches on the busways, using required sizes of conduit and wires. Where a subfeeder supplies both a 480-volt panel and a 120-volt panel, a main circuit breaker is mounted in the 120-volt panel. There are a number of subfeeders in the manufacturing building so arranged. In a typical case, a subfeeder of three No. 1/0 conductors and a No. 2 neutral—in a 2-in. conduit run—is tapped from a busway run through a 200-amp bus tap switch fused at 125 amps. At the end of the conduit run, both a 480-volt panel and a 120-volt panel are supplied from a junction box. The 480-volt panel is fed directly by the No. 1/0 conductors and the 120-volt panel is fed by taps from the subfeeder through a transformer. In

a typical case, the transformer is a 15-kva unit, is fed by three No. 6's from the JB and feeds the main CB in the 120-volt panel by four No. 6's. The panel main CB is a 100-amp, 3-pole device and is required by section 3883 a. of the Code which states that "a lighting and appliance branch circuit panelboard supplied by conductors having overcurrent protection greater than 200 amps shall be protected on the supply side by overcurrent devices having a rating not greater than that of the panelboard." In this case, the No. 6 conductors from the transformer to the panel are protected by only the 125-amp fuses in the bus tap switch. Although this is not, in itself, "protection greater than 200 amps", it can be seen readily that through the transformer it represents protection considerably in excess of 200 amps. The No. 6's on the secondary side of the transformer could draw 290 amps before the 125-amp fuses would open the circuit. The 100-amp main CB is not in excess of the rating of the panelboard and provides protection for the transformer. The No. 6's are unprotected taps, as covered in section 2434 of the NE Code.

Busways

Busway is used for the major part of the distribution system. Twelve separate sections are used in the manufacturing building. All



BOILER ROOM contains extensive electrical circuiting and controls for three 600-hp refrigeration motors and over 600-hp of other motor load for air conditioning equipment. The entire plant is air-conditioned.

of the busway is rated 480 volts, 600 amps, 3-phase, 4-wire, plug-in type. The runs are supported every 5 ft with angle brackets and rods, mounted at a height of 15 ft. Feeder conductors supplying each busway run are connected by cable lugs to the bus bars. Where busway runs cross structural joints in the building, expansion-joint couplings are used.

Power equipment installation included motors, starters and disconnect switches. As shown in accompanying illustrations, this equipment covered unit heaters, thermostats, aquastats, sump pump equipment, overhead door equipment, lift station equipment, refrigeration compressors, condensate pumps, chilled water pumps, cooling tower pumps, fan motors and wiring to boiler room control panel.

Although only the distribution system is described here, this plant boasts an unusually high degree of modern electrical utilization. High, comfortable lighting levels are provided throughout the plant by continuous-row slimline fixtures and high-bay mercury vapor lighting. In the drafting rooms in the office building, over 17,000 sq ft of luminous ceiling are used. And the entire plant is air conditioned throughout by over 2400 tons of refrigeration capacity.

The builders on this project were the Amtex Building Corp., a subsidiary of J. Emil Anderson and Son, Chicago.

Apartment Survey Shows Electrical Needs

Con Edison asks New York apartment dwellers about electric kitchens, wiring and appliances.



SEVENTY percent of the population of New York City lives in apartment houses. Most apartment dwellers are deprived of many electrical conveniences enjoyed by those who live in single family homes because of poor kitchen design and inadequate wiring. Yet apartment dwellers want modern electrical appliances.

These facts were disclosed in an extensive opinion and fact-finding survey directed at a statistically balanced selection of 1531 housewives who live in new and old apartments and represent a cross-section of income groups. The survey was conducted by the Consolidated Edison Company and reported last month to apartment building construction, real estate management, electrical and allied groups.

According to Con Edison's survey, housewives in New York City apartments want the same beauty, utility and conveniences in their kitchens as they have seen and read about in the kitchens of private homes. And when it comes down to a question of dollars and cents, they are willing to pay for what they want.

As a result there exists a tremendous opportunity for landlords to provide apartment features that will lead to a greater tenant stability; a vast, untapped market for manufacturers, distributors and dealers in the appliance and kitchen equipment fields, and for electrical contractors; and a challenge for architects to evolve new design concepts.

Apartment-dwelling housewives questioned said they want and need larger kitchens, more counter and

cabinet space, better lighting, bigger refrigerators, more freezer space, more electrical outlets and sufficient electric capacity to back them, kitchen fans, electric broilers, coffee makers, mixers, improved range design, electric dishwashers and combination washer-dryers.

The survey revealed that in most respects these desires are not being met. Nor is any important trend toward improvement evident. A little improvement in a few categories was found in apartment buildings less than five years old, compared with those more than five years old. However, in most cases there has been no change, and in some the trend actually has been away from popular demand.

To find out why, in addition to the effect of inadequate wiring, electric consumption in New York City apartments has lagged below both the local and national average for private homes, Con Edison decided to "Ask the Ladies".

Their response not only answered Con Edison's quest for facts, but also yielded information equally startling and important for architects, builders, the appliance industry and landlords. This is what the ladies said:

Lighting—The Illuminating Engineering Society recommends a lighting level of 40 footcandles for kitchen work area. Lighting in the average New York City apartment is 75% below this, at a level of 10.2 footcandles.

Forty percent of the women questioned want over-sink kitchen lighting. Only about 4% have it. Thirty-four percent want lighting over the range. Only 2% have it.

Fourteen percent want under-cabinet lighting. Less than 1% have it.

Appliance outlets—Two-thirds of the women say they do not have enough kitchen appliance electric outlets. More than half want plug-in strip-type outlets above the counter.

There is widespread demand for most of 17 electric kitchen appliances listed in the survey which again emphasizes the need for adequate electric wiring in apartments.

More than 99% of the housewives questioned have gas ranges. But about 34% of them would prefer an electric range.

Only one apartment housewife in 30 has an electric dishwasher. But 12 out of 30 want one—a demand of 40%. About 25% of these say they are willing to pay more rent to get one.

Only 17% have their own clothes dryer. Forty percent want their own washers, and specify automatic units. Fifty percent want a combination washer-dryer and are willing to pay more rent if the landlord would install it.

To help industry groups in New York City make the necessary improvements and develop this vast market which exists for all these features of modern electric living, Con Edison announced the establishment of an Apartment House Division to advise in kitchen design.

This group supplements the already existing Adequate Wiring Bureau, which provides advisory service in the electric wiring field, and the Lighting Division, which helps customers plan modern lighting and select proper equipment.

450 FOOTCANDLES are provided throughout this 252 sq ft office, create an ideal seeing environment which may be compared to that found outdoors on a clear summer day in the shade of a tree.



200 FOOTCANDLES in same office is more than four times the amount of light found in the average office today. Lighting intensity is shown on footcandle meter mounted on stand between desks.



450 Footcandles Light An Office

Test installation of fluorescent lamps in Troferall lighting system demonstrates that high lighting levels can be made comfortable, and that lighting results compare favorably with daylight.

By Berlon C. Cooper

ILLUMINATING engineers have long referred to outdoor lighting, such as that found in the shade of a tree on a clear summer day, as the ideal in intensity, quality and comfort for easy seeing. Also, much of the visual and lighting research of past years seems to indicate that some 400 to 500 footcandles is optimum for visual tasks such as found in typical offices. This is about eight to ten times the intensities in use generally.



100 FOOTCANDLES as shown here represents outstanding lighting jobs now in use, compared with current standards. Note that relative brightness of daylighted venetian blinds to walls has increased.



50 FOOTCANDLES, today's accepted standard for office lighting, is dark and dismal by comparison with "shade of a tree" outdoor illumination. With blinds up, outdoor brightness becomes glaring by contrast.

How can lighting levels of this magnitude be provided indoors and be made comfortable to work with? That's the question two General Electric illuminating engineers at Nela Park, Cleveland, set out to answer last year. These two engineers, Carl Allen and Will Fisher, school and office lighting specialists respectively, designed and had installed in their own offices an experimental lighting system which provides 450 footcandles on the desk tops, comparable in intensity with the outdoor intensity considered as ideal. The system is dimmer controlled, which permits selection of any lighting intensity desired up to its 450 footcandles maximum. Since its completion

last fall, it has been under constant study and analysis, from the standpoint of visual comfort, desirable lighting level, physical and psychological comfort, and general reaction. These two lighting specialists are getting first-hand experience in working under what is considered really high indoor lighting levels.

Lighting equipment used for this experimental lighting system was selected in line with usual good lighting practice. Etched aluminum troffers of the two-lamp cross-louvered type were selected. Three 4-ft long units were installed end to end across the width of the room, and these 12-ft long rows were then installed edge to edge,

or side by side, down the length of the room so that the luminaires practically covered the ceiling—so it was logically dubbed a "troffer-all" ceiling.

Viewed crosswise, the etched aluminum troffers, with an individual parabolic reflector for each 4-ft lamp, are very low in brightness. Cross louvers shield the lamps lengthwise of the troffer. Thus the brightness of the units, viewed from any direction in the direct glare zone, is about as low as it is possible to get on any type of fluorescent luminaire.

The problem of reflected glare remains, and originally was expected to be a major one. In actual use, however, this problem is more

Three Examples of Modern Office



RECESSED aluminum luminaires with parabolic reflectors give excellent light control in small narrow office.

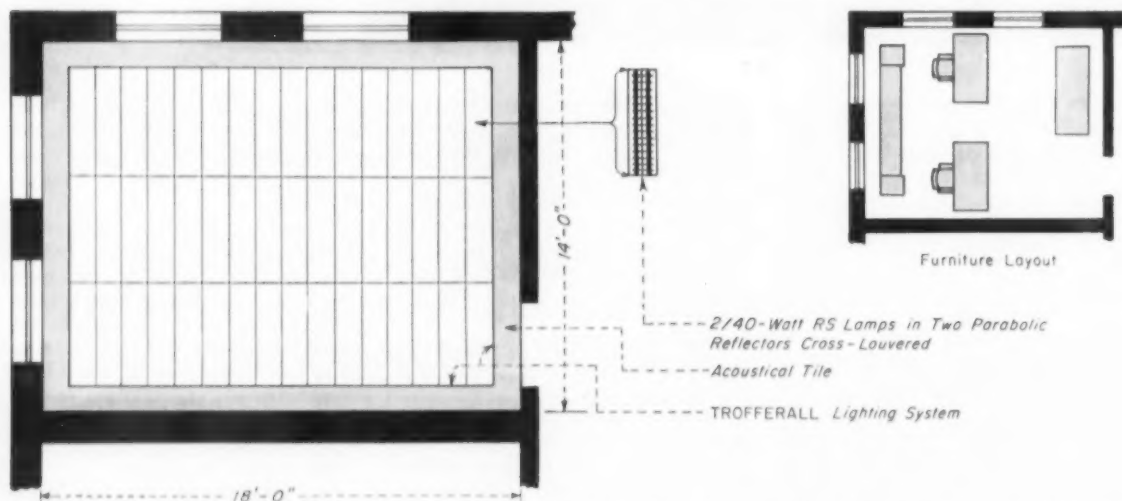


CUSTOM DESIGN luminaires provide good appearance, excellent seeing comfort, and high levels of illumination.

or less academic. First of all, Allen and Fisher state that they seldom work with materials that have glossy surfaces, which would reflect the full surface brightness of the fluorescent lamps exposed to work surfaces on desk tops to create the reflected glare. Second, they have found that as illumination levels on the desk tops are increased, the contrast (ratio) between the reflected image of the fluorescent lamps overhead and the

brightness of the visual tasks or their surrounds (intensity times reflection factor of surface) would decrease. For example, assume a letter written on white bond paper with an 80% reflection factor, and the brightness of the 40-watt rapid start fluorescent tube overhead as 1900 footlamberts. With an illumination intensity of 50 footcandles, the reflectance of the letter would be 40 footlamberts ($50 \times 80\% = 40$), and the ratio of the

lamp brightness to the reflected brightness of the letter would be 47.5 ($1900/40 = 47.5$). But if the intensity is increased to 450 footcandles, the reflectance of the letter would be 360 footlamberts ($450 \times 80\% = 360$), and the ratio of the lamp brightness to the letter brightness would be 5.3 ($1900/360 = 5.3$). This assumes only that the 50 footcandle level would be obtained with fewer lamps operating at full brightness, as is general



EXPERIMENTAL lighting system which produces 450 footcandles at full light output in 252-sq-ft office consists of 16 rows of 12-ft long 2-lamp troffers installed edge-to-edge. A total of 96 40-watt rapid-start cool-white fluorescent lamps are used, controlled by three electronic dimmers for complete flexibility in lighting intensity.

Lighting Practice



SUSPENDED plastic luminaires equipped with deluxe warm white lamp enhance warm atmosphere in this office.

practice, and that the 450 foot-candle level would also be obtained with lamps at full brightness.

To add flexibility to the system, dimming type ballasts (GE Cat. No. 89G542) and 120-volt thyatron dimmers were used. There are three separate dimmer controls, one for each third of the room from front to back. Since each control provides stepless dimming from full light output down to nearly blackout, the variety of combina-

tions possible is practically infinite. The complete installation contains 96 40-watt rapid start cool white lamps. When all lamps are operated at full brightness the load is close to 5400 watts, or about 21 watts per square foot.

In actual practice, it is interesting to note that the occupants regularly operate the system at full light output. The dimmers are used primarily to demonstrate the room to visitors.

From a physical comfort standpoint, it has been found that the radiant heat generated is about on the dividing line between being noticeable and not being noticeable. The heat is barely noticeable at all in the morning, but somewhat more definitely later in the day. This is attributed to the added long-wave infrared energy radiated by the luminaires after they have been thoroughly heated up. Temperature measurements on various parts of the troffers range from 100° to 115° F, and lamps warm up to about 125° F. This is considered high enough to cause some sensation of heat, but not enough to be described as definitely excessive, especially since the room is quite adequately air conditioned with air entering the room from the air duct at 73° F at a rate of one complete air change every five minutes.

The first thing noticed by visitors to this office is that the whole room *does* look unusually bright. Most agree, however, that this impression lasts only momentarily, while their eyes are becoming adapted to brightnesses several times higher than those encountered in the corridor or in nearby offices. The ceiling does not appear bright when viewed from the doorway with gaze kept at eye level, nor from working position when sitting at one of the desks.

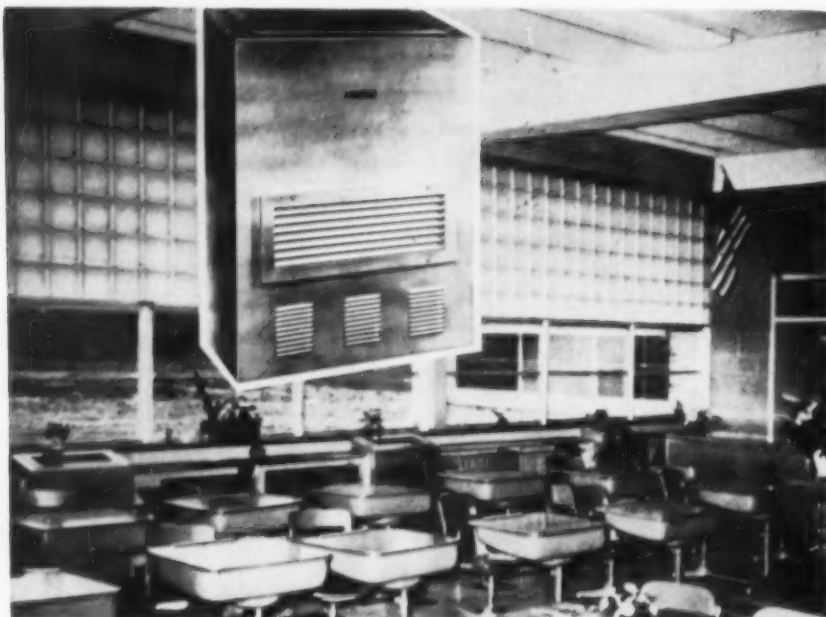
This installation is already serving to prove that higher lighting levels are practical and possible, and that they can be made comfortable, both visually and otherwise.



THREE ROWS of luminaires were used in this office to provide high intensity over work areas along side walls. Light finish linoleum on work surfaces improves visual environment.



WIDE four-lamp suspended luminaires provide wide light distribution and low brightness to light work surfaces and shelving in this typical small office.



TYPICAL CLASSROOM is heated by four heater-ventilators (inset) built into outside wall. Units heat and recirculate room air, heat and circulate fresh outside air. Each unit serves approximately 250 sq ft of floor space at an electrical load of 14 watts per sq ft.

It's here . . .

THE ALL-ELECTRIC SCHOOL

Success of the much-publicized electrically heated Parkside School in Hartford City, Indiana, adds impetus to serious consideration of electric heat as a school-heating medium.

By **Robert Lee Boyd**, *Development Engineer*
Electromode Div. of Commercial Controls Corp., Rochester, N. Y.

THE heating installation of the Parkside School in Hartford City, Ind., presents a very strong argument in favor of electricity as a school heating medium. Now in its second winter of use, it contributes interesting information on (1) the comparative cost of oil and electric systems in similar schools; (2) the value of controls in promoting efficient operation; and (3) heating cost estimates which take into consideration night set-back of thermostats, ventilation heat loss, and auxiliary heat gains.

It was not possible to build the entire school at once, so the initial

problem involved heating eight elementary rooms, one kindergarten room, a general office, a principal's office, a health room and a teachers' room.

Cost

Requirements for heating and ventilating were initially set up as follows:

Temperature: To be maintained at 70F for 9½ hours from 6:30 AM to 4:00 PM 5 days per week; at 50F at all other times.

Ventilating: Outside air to be furnished classrooms and kindergarten room during the 6½-hr

school day from 8:30 AM to noon and from 1:00 PM to 4:00 PM. Total minimum capacity of outside air: 300 CFM for classrooms, 450 CFM for kindergarten. Outside air to be ¼ of total air circulated in these rooms.

The procedure for determining heating requirements based on these specifications and calculated heat losses is shown in Table I.

Actually, the estimated \$2761.94 was more conservative than is indicated by the actual costs. Temperature was maintained at 74F and frequently higher instead of 70F; ventilation controls were improperly adjusted for most of the

winter; daytime temperature was maintained for 12 hours instead of 9½ to accommodate early arrival and late departure of teachers; and degree-days for the year were 8% higher than normal.

Combined, these deviations from original plans should have resulted in costs about 35% higher than normal. Assuming this was the case, actual costs experienced for the first year, then, would indicate a normal operating cost (for October through May) of \$2000.

However, "normal" as used here indicates operation according to original specifications. Although initial confusion with ventilation controls was ironed out, the thermostat settings, the hours of use to which the building will be put, and the weather still defy accurate analysis. The estimate resulting from the calculations of Table I allows for these unpredictables and is on the safe side.

The feasibility of electric heat for schools is forcefully illustrated by a comparison of initial cost of the Parkside School with an oil-heated school of identical size in the same general area. These costs, together with the operating costs, are given in Table II.

The savings in general costs were due to the elimination of the boiler room, stack and associated construction. Note that the dollar value of the total work done by the electrical contractor was doubled by the addition of electric heat, while the value of work done by the plumbing and heating trades dropped by more than two-thirds.

Operating costs for the first year reflect these higher expenses for the oil-heated school through the additional interest charges shown. It is significant that even at 2-cent electricity (which is a higher rate than is usually offered for electric heating loads) and 11½-cent oil (which is lower than average), actual energy costs for the two schools were about the same. The balance will go decidedly to the credit of electric heat during the second winter, since a new 1½-cent electrical rate has gone into effect for public schools in the area, and also because of the rising oil costs since the Mid-East crisis.

Equipment and Circuiting

Heating equipment installed in the completed portion of the school includes 38 unit ventilators in the

classrooms, 12 conventional built-in wall units in offices and corridors, and 3 kw of heating cable in the kindergarten floor—a total of 163 kw.

The bulk of the heating is done

by the unit ventilators, developed for the job by the Electromode Division of Commercial Controls Corp. (Fig. 1). Fresh air is delivered by a double squirrel-cage blower through a 1½-kw heater con-

TABLE I—Heating Capacity Calculations

Heat Loss:

Structure only (excluding infiltration and ventilation): (or 34.8 kwhr per degree-day)*	116 kw
Infiltration plus ventilation: (or 25.5 kwhr per degree-day)*	85 kw
Infiltration alone: (or 20.4 kwhr per degree-day)*	68 kw

$$* \text{ kwhr per degree-day} = \frac{\text{kw heat loss} \times 24 \text{ hrs/day}}{80 \text{ deg temp diff}}$$

Rate of Loss:

Structure only:	
70F to be maintained 9½ hrs/day × 5 days/wk or 47½ hrs/wk (or 28.3% of the time)	
50F to be maintained at all other times (or 71.7% of the time)	
Infiltration plus ventilation:	
This condition occurs 6½ hrs/day × 5 days/wk or 32½ hrs/wk (or 19.3% of the time)	
Infiltration only:	
This condition occurs at all other times (or 80.7% of the time)	

Degree-Days:

To the base 65F: 5600 To the base 45F: 1760
(Degree-days are used to the normal 65F base when temperatures are to be kept at a normal 70F. However, maintaining the temperature 20 degrees lower, at 50F, necessitates use of a 20-degree lower base.)

Annual Energy Consumption:

Structure:	
Day: 34.8 kw × 5600 D.D. × 28.3% = 55,151 kwhr/yr	
Night: 34.8 kw × 1760 D.D. × 71.7% = 43,915 kwhr/yr	
Ventilation plus infiltration:	
25.5 kw × 5600 D.D. × 19.3% = 27,560 kwhr/yr	
Infiltration only:	
20.4 kw × 1760 D.D. × 80.7% = 28,975 kwhr/yr	
Total (for dark, empty building):	155,601 kwhr/yr

Heat Credits:

Sensible heat emission:	
180 children × 150 Btu/hr/child:	7.9 kw
Lighting fixtures:	16.0 kw
Total:	23.9 kw
This credit, however, applies only during the 21.5 weeks of the year that heating is normally required:	
23.9 kw × 6½ hrs/day × 5 days/wk × 21.5 wks/yr = 16,700 kw/yr credit.	
The difference between keeping the rooms at 70F and 50F during the 2-week Christmas vacation is 804 kwhr:	
16,700 kwhr + 804 kwhr = 17,504 kwhr total credit.	

Cost:

Net energy requirements for year = 155,601 kwhr — 17,504 kwhr	
= 138,097 kwhr	
At 2¢/kwhr, estimated annual cost = \$2761.94	
Actual metered cost for first year, Oct. through May: \$2669.60	

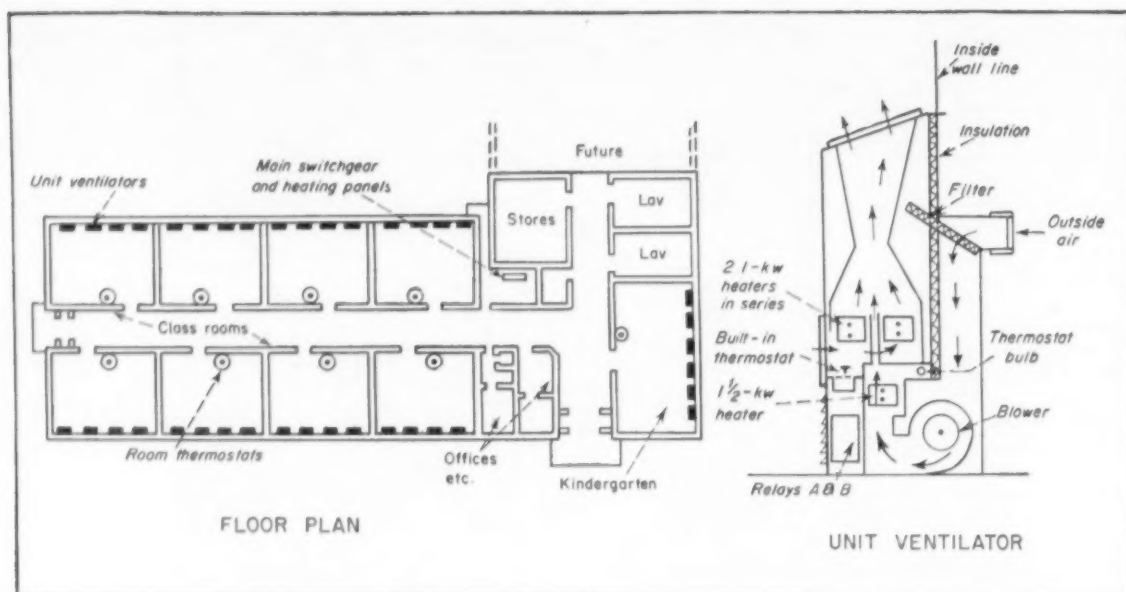


FIG. 1. Layout shows location of heating-ventilating units in classrooms and kindergarten. Path of fresh air and recirculated room air through unit is shown in cross-sectional view at right.

trolled by a built-in thermostat. This air induces recirculated room air which is reheated by a 2-kw heater, and the mixture is discharged through the top of the unit into the room. This constant input of fresh, tempered air forces out a like amount of stale air through an exhaust mounted on the roof which is supplied through two common plenums over the main corridor. When the blower is not operating, the heating unit performs as a 2-kw gravity heater. Four such heaters have been installed in each regular classroom, six in the larger kindergarten room. Average floor area heated by each unit is 250 sq ft, an electrical load of 14 watts per sq ft.

The economical operation experienced was made possible by the controls used to regulate these units. A central time clock changes operation from day to night thermostat settings (Fig. 2). Relays are arranged so that the 2-kw heater is operated by the 70F contacts of the thermostat during the daytime, while the day clock contacts are closed, and by the 50F contacts during the night, while the night contacts are closed. The 1.5-kw heater and blower are not controlled by the room thermostat and operate only during school hours. A built-in thermostat in the unit controls the heating of the incoming air for proper mixture with

air recirculated from the room.

All heaters are rated 208 volts. Circuits are protected by 2-pole 30- and 40-amp breakers in four heating panels which are mounted in the school's main switchgear. Branch circuits are distributed

through underfloor raceway beneath unit ventilators along outside walls (Fig. 3).

Heaters and heating circuits were installed by the Moorehead Electric Co., electrical contractors of Marion, Ind.

TABLE II—Oil vs Electricity: Construction and Operating Costs

(Based on complete, 26,000-sq ft buildings)

	Comparative School in Same Area (Oil)		Parkside School Hartford City, Ind. (Electric)		Savings Electricity over oil	
	Cost	%*	Cost	%*	Savings	%*
Initial Costs:						
General:						
Building, furnishings, etc.	\$287,093	69.2	\$271,390	76.4	\$15,703	4.4
Mechanical:						
Electrical	29,385	7.1				
Heating & plumbing	97,896	23.7				
Plumbing & ventilating			25,746	7.2		
Electrical and heating			58,595	16.4		
Total mechanical	\$127,281	30.8	\$84,341	23.7	\$42,940	12.1
Total initial costs	\$414,374	100%	\$355,731	100%	\$58,643	16.5%
Operating Costs:						
Fuel oil (11.5¢/gal)	\$3,679**					
Electricity for heating (2¢/kwhr)			\$4,319***			
Interest on initial extra investment @ 4%	2,346					
Total operating costs	\$6,025		\$4,319		\$1,706	

* Percent of total construction costs

** Actual bill

*** Includes actual bill of \$2669 for Oct. through May plus \$1,650 estimate for remaining portion of building not yet constructed.

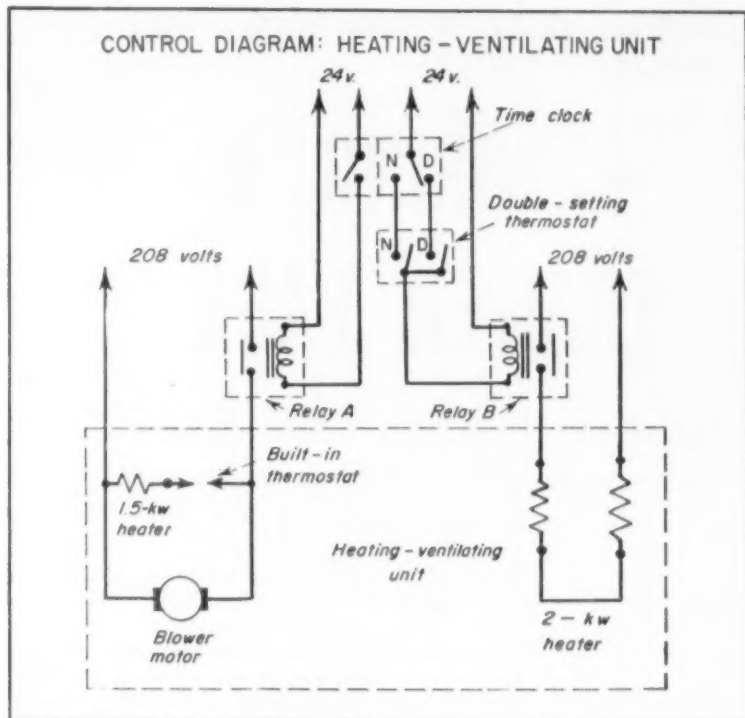


FIG. 2. Simplified schematic control diagram of heater-ventilator units. Pre-set master time clock makes or breaks SPST and SPDT switches controlling relay A and room thermostat. Relay A controls blower and energizes 1.5-kw outside air heater under direction of built-in thermostat. Day setting is arranged for a pre-heat period to bring up temperature in the morning; blowers are switched on only during hours of classes. Relay B controls main 2-kw heater under direction of room thermostat switched to night setting by time clock.

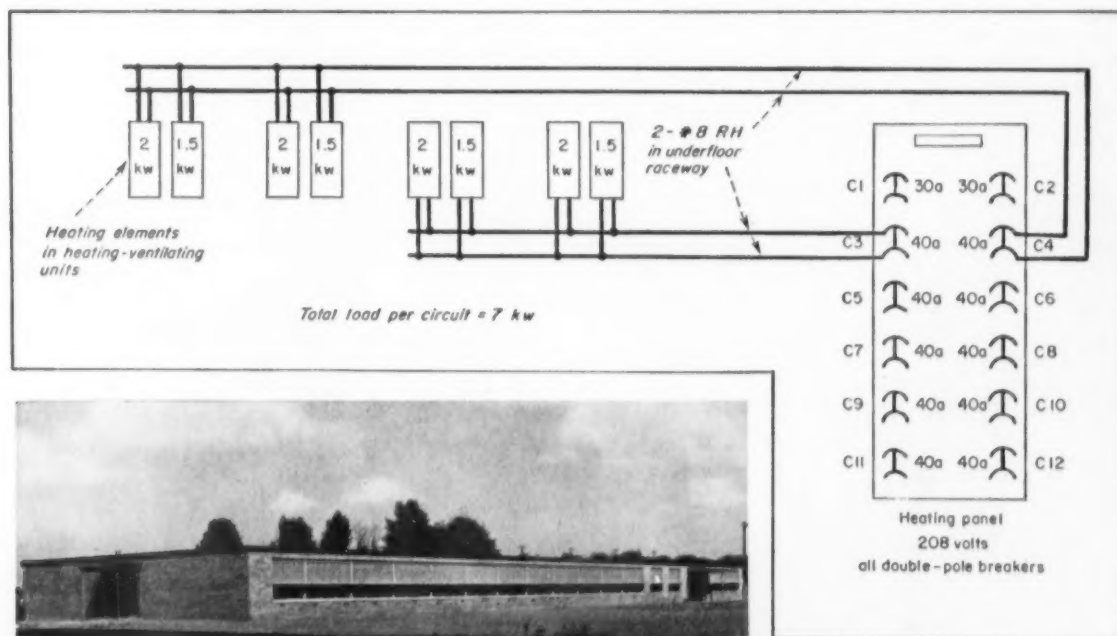


FIG. 3. Typical heating panel. One classroom heating circuit is included to show method of connection used to balance circuits on the #8 RH, 208-volt, single-phase circuits. Heating panels are built into main switchgear; panels are 3-phase, 208 volts, with circuits balanced between phases.

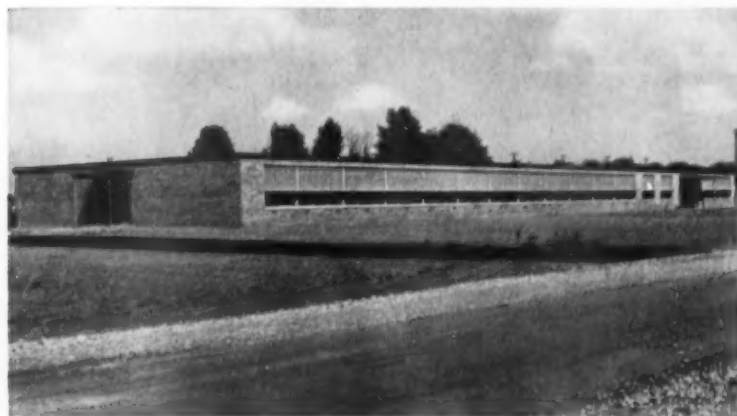


FIG. 4. School is of masonry and glass block construction with flat, 2½-in.-thick planked roof. 2-in. perimeter insulation was installed completely around floor slab; walls and ceilings were insulated with 2-in. blocks of Foamglas 12 in. wide and 18 in. long. Portion completed measures approximately 85 x 220 ft.

Load-center transformer bank brings economy to . . .

REWIRING A TRAILER PARK

How a special mounting for service transformers solved a big problem in modernizing a growing trailer park in Moonachie, N. J.

By James Flynn, President, Flynn Electric Co., Paramus, N. J.

STEEL-FRAME mounting of service transformers broke a serious bottleneck in the electrical expansion of Metropolitan Trailer Park, Moonachie, N. J. Here, the mounting used for the transformers permitted full and flexible rewiring for modern electrical usage in trailers, with the least possible loss of valuable trailer

space. The installation is a "first" of its type in this area and may be the key to breaking open the big market for trailer park modernization.

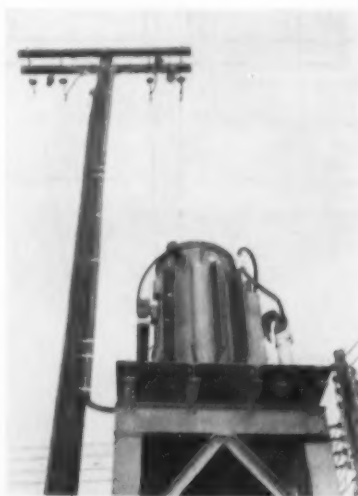
Prior to the new installation, the trailer park was served from three 37½-kva transformers mounted on a pole along the road which runs by the park. From these transformers,

service conductors were brought down to metering and switching equipment at which point outgoing feeders originated. These feeders were carried overhead on poles throughout the park and were brought down poles at various locations to make underground runs to individual trailers.

As a result of growth of the park



OVERHEAD PRIMARY supply conductors are brought in to dead-end clevises on double-armed pole at approximate center of trailer park. Three-phase, 4-wire primary has grounded neutral, with grounding conductor run down pole under wood molding to ground rod. Lightning arresters are mounted on crossarm, protecting each of 3-phase legs. Pole has single guy on opposite side of pole from supply.



TRANSFORMER FEED is made by primary supply conductors, down pole in duct to level of transformers then looped over to primary connections. Transformers are 75-kva, single-phase units, connected wye-wye with a 120/208-volt, 3-phase, 4-wire secondary. Platform for transformers is sheet steel on I-beam supports, mounted on 12-ft high H-beam frames set in concrete.



SERVICE FEEDER, carried down in two 4-in. conduit runs at left, consists of two 500MCM RH conductors per phase and two for neutral. Each conduit carries one of each of three phases and one neutral. Conduit runs enter top of wooden shack, carrying conductors to double 500MCM lugs per phase on line side in CT cabinet. Four conduit runs from side and end of shack are outgoing feeders.

—continual addition of more trailers—and increasing use of television and other appliances in the trailers, the old service and distribution system became completely inadequate for the requirements. And the situation was aggravated by the fact that the park was expanding away from the service transformers. Addition of new trailers required continual lengthening of overhead feeders. Coupled with general increase in electrical utilization, the lengths of the feeders brought extremely low voltage—90 volts instead of 120—to most areas of the park. Appliances were not working properly, 21-in. TV sets had 10-in. pictures and lights did not produce sufficient output. The need for a new service and system layout was obvious.

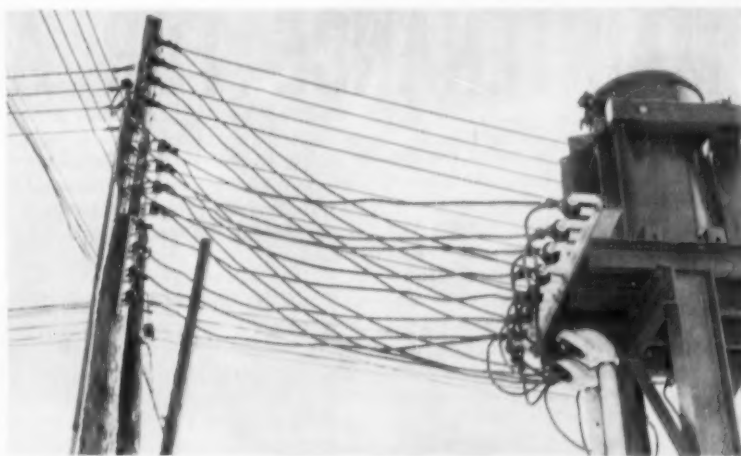
The first decision on the new system recognized the necessity of a load-center layout. To minimize the lengths of feeder runs to serve the far reaches of the park, the service transformers had to be mounted in the center of the park. The old transformers would be removed from the primary pole at the road; the primary line would be extended to a pole at the approximate load center of the park; and new service transformers would be installed there. But this is where the new design hit a big snag.

To meet the present and foreseeable electrical loads in the park, design calculations dictated the use of three 75-kva transformers connected wye-wye from the utility primary to a 120/208-volt, 3-phase, four-wire secondary. But the maximum size of transformer installation which the utility would use on a pole was three 50-kva transformers. To use three 75-kva units, utility regulations called for a standard transformer mat installation—a poured concrete base, set in a bed of crushed stone surrounded by a cyclone fence. Such an installation covers an area about 14 ft by 20 ft and would require a 10-ft clearance, on all sides, between it and any trailer or building. From the standpoint of the owner of the park, this was simply too much rentable space to give up permanently. It would have meant the removal of four trailers from the center of the park. Some other plan had to be worked out.

Discussions with the owner and with the utility brought forth the possibility of special platform mounting of the transformers ad-



WOODEN SHACK, constructed of heavy plywood and labeled with "Caution—High Voltage" signs, houses CT and metering equipment and service disconnecting and protection devices. Padlocked door provides access only for authorized personnel. From load side lugs in CT cabinet (seen in photo at left), No. 2/0 secondary feeders are carried in a wireway (seen below CT cabinet in photo at left) to four fused switches. Fused switches are mounted on wall of shack. Each of two bottom switches is fed by a separate set of four No. 2/0 RH conductors in the bottom wireway. And each of two top switches is fed by a separate set of four No. 2/0 RH conductors carried in conduit shown from bottom wireway to top wireway. Each of the four switches is a 200-amp, 4-pole, solid neutral device with 200-amp fuses. With this setup, the two sets of 500MCM conductors coming down into the shack constitute a single feeder of multiple conductors, with each of the four switches tapped from 4-conductor lugs per phase on load side of CT's to provide equal division of load current among all conductors as required by Sec. 3105 of NEC.



OUTGOING FEEDERS, from each of four switches in shack, are carried out of shack in 2½-in. conduit runs up to service heads from which conductors are looped to secondary racks. The secondary racks are bolted to an angle-iron cross piece on the transformer platform. Conductors are No. 2/0 RH and are carried from racks on platform up to racks on pole. From pole shown No. 2 RH feeders are run on poles throughout the park. At various points subfeeders of three No. 4 RH conductors are taken from the aerial feeders and carried to load centers where three No. 6 RH conductors are carried down in 1-in. conduit to a four-circuit outdoor CB panelboard. From this panel, supply is made to individual trailers.

acent to a pole at the center of the park. This plan was carried out as shown in the accompanying photos. For the utility it represented a departure from standard service regulations, but their engineering de-

partment approved the safety and operating conditions of the installation. The installation, taking up the least possible space, may become a prototype for similar service arrangements in other trailer parks.



Load-center transformer bank brings economy to . . .

REWIRING A TRAILER PARK

How a special mounting for service transformers solved a big problem in modernizing a growing trailer park in Moonachie, N. J.

By James Flynn, *President, Flynn Electric Co., Paramus, N. J.*

STEEL-FRAME mounting of service transformers broke a serious bottleneck in the electrical expansion of Metropolitan Trailer Park, Moonachie, N. J. Here, the mounting used for the transformers permitted full and flexible rewiring for modern electrical usage in trailers, with the least possible loss of valuable trailer

space. The installation is a "first" of its type in this area and may be the key to breaking open the big market for trailer park modernization.

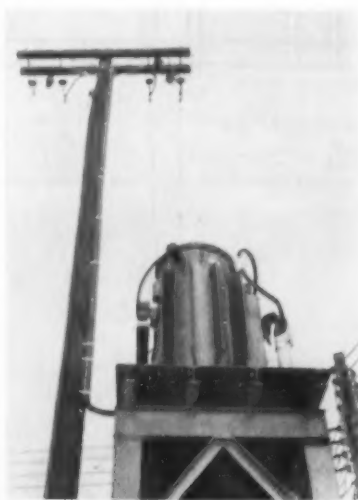
Prior to the new installation, the trailer park was served from three 37½-kva transformers mounted on a pole along the road which runs by the park. From these transformers,

service conductors were brought down to metering and switching equipment at which point outgoing feeders originated. These feeders were carried overhead on poles throughout the park and were brought down poles at various locations to make underground runs to individual trailers.

As a result of growth of the park



OVERHEAD PRIMARY supply conductors are brought in to dead-end clevises on double-arm pole at approximate center of trailer park. Three-phase, 4-wire primary has grounded neutral, with grounding conductor run down pole under wood molding to ground rod. Lightning arresters are mounted on crossarm, protecting each of 3-phase legs. Pole has single guy on opposite side of pole from supply.



TRANSFORMER FEED is made by primary supply conductors, down pole in duct to level of transformers then looped over to primary connections. Transformers are 75-kva, single-phase units, connected wye-wye with a 120/208-volt, 3-phase, 4-wire secondary. Platform for transformers is sheet steel on I-beam supports, mounted on 12-ft high H-beam frames set in concrete.



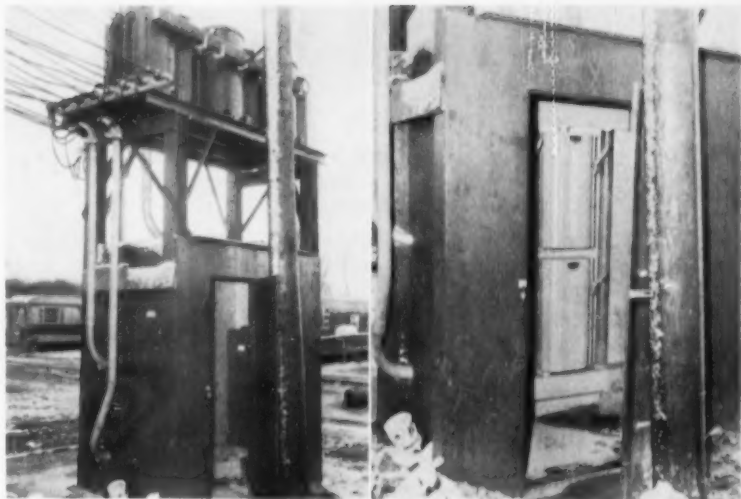
SERVICE FEEDER, carried down in two 4-in. conduit runs at left, consists of two 500MCM RH conductors per phase and two for neutral. Each conduit carries one of each of three phases and one neutral. Conduit runs enter top of wooden shack, carrying conductors to double 500MCM lugs per phase on line side in CT cabinet. Four conduit runs from side and end of shack are outgoing feeders.

—continual addition of more trailers—and increasing use of television and other appliances in the trailers, the old service and distribution system became completely inadequate for the requirements. And the situation was aggravated by the fact that the park was expanding away from the service transformers. Addition of new trailers required continual lengthening of overhead feeders. Coupled with general increase in electrical utilization, the lengths of the feeders brought extremely low voltage—90 volts instead of 120—to most areas of the park. Appliances were not working properly, 21-in. TV sets had 10-in. pictures and lights did not produce sufficient output. The need for a new service and system layout was obvious.

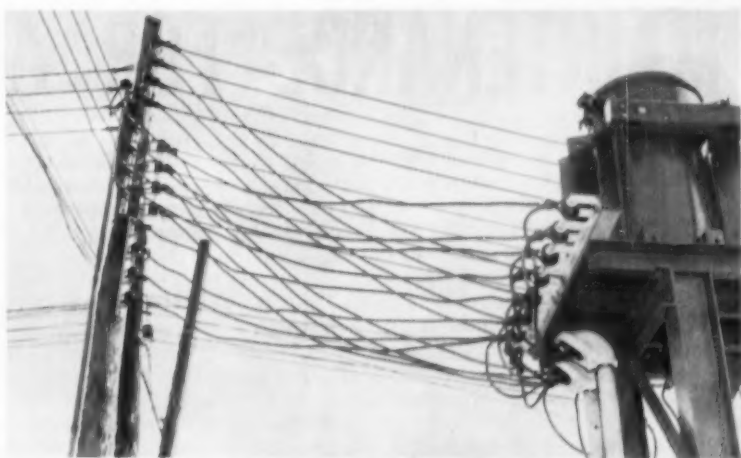
The first decision on the new system recognized the necessity of a load-center layout. To minimize the lengths of feeder runs to serve the far reaches of the park, the service transformers had to be mounted in the center of the park. The old transformers would be removed from the primary pole at the road; the primary line would be extended to a pole at the approximate load center of the park; and new service transformers would be installed there. But this is where the new design hit a big snag.

To meet the present and foreseeable electrical loads in the park, design calculations dictated the use of three 75-kva transformers connected wye-wye from the utility primary to a 120/208-volt, 3-phase, four-wire secondary. But the maximum size of transformer installation which the utility would use on a pole was three 50-kva transformers. To use three 75-kva units, utility regulations called for a standard transformer mat installation—a poured concrete base, set in a bed of crushed stone surrounded by a cyclone fence. Such an installation covers an area about 14 ft by 20 ft and would require a 10-ft clearance, on all sides, between it and any trailer or building. From the standpoint of the owner of the park, this was simply too much rentable space to give up permanently. It would have meant the removal of four trailers from the center of the park. Some other plan had to be worked out.

Discussions with the owner and with the utility brought forth the possibility of special platform mounting of the transformers ad-



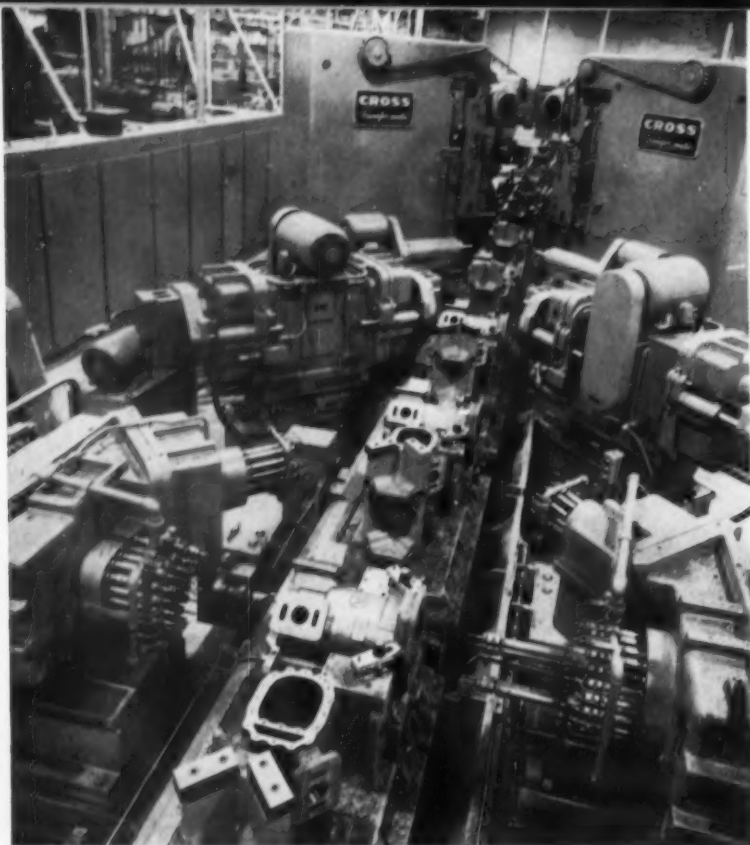
WOODEN SHACK, constructed of heavy plywood and labeled with "Caution—High Voltage" signs, houses CT and metering equipment and service disconnecting and protection devices. Padlocked door provides access only for authorized personnel. From load side lugs in CT cabinet (seen in photo at left), No. 2/0 secondary feeders are carried in a wireway (seen below CT cabinet in photo at left) to four fused switches. Fused switches are mounted on wall of shack. Each of two bottom switches is fed by a separate set of four No. 2/0 RH conductors in the bottom wireway. And each of two top switches is fed by a separate set of four No. 2/0 RH conductors carried in conduit shown from bottom wireway to top wireway. Each of the four switches is a 200-amp, 4-pole, solid neutral device with 200-amp fuses. With this setup, the two sets of 500MCM conductors coming down into the shack constitute a single feeder of multiple conductors, with each of the four switches tapped from 4-conductor lugs per phase on load side of CT's to provide equal division of load current among all conductors as required by Sec. 3105 of NEC.



OUTGOING FEEDERS, from each of four switches in shack, are carried out of shack in 2½-in. conduit runs up to service heads from which conductors are looped to secondary racks. The secondary racks are bolted to an angle-iron cross piece on the transformer platform. Conductors are No. 2/0 RH and are carried from racks on platform up to racks on pole. From pole shown No. 2 RH feeders are run on poles throughout the park. At various points subfeeders of three No. 4 RH conductors are taken from the aerial feeders and carried to load centers where three No. 6 RH conductors are carried down in 1-in. conduit to a four-circuit outdoor CB panelboard. From this panel, supply is made to individual trailers.

jacent to a pole at the center of the park. This plan was carried out as shown in the accompanying photos. For the utility it represented a departure from standard service regulations, but their engineering de-

partment approved the safety and operating conditions of the installation. The installation, taking up the least possible space, may become a prototype for similar service arrangements in other trailer parks.



PRODUCTION LINE machines 18 compressor forgings automatically every hour, with a total of 160 individual tools applied to the machining of each compressor case as it passes through this Cross Transformatic automatic tool. Even a brief down time for repairs would result in lost production, so preventive maintenance is recognized as a vital operation.

MAINTENANCE FOR AUTOMATION

AUTOMATION, to many people, signifies a completely automatic factory—all machines—no people. This is certainly far from the truth. As we know it today in industry, automation is the change from manual to automatic control of machines or processing lines. This evolution has been going on for many years but recently has been going on at a greatly accelerated rate.

This rapid trend to automation has accentuated the importance of maintenance.

Alert management recognizes that maintenance is of equal importance with production, since with automation, production is so dependent on good maintenance.

With automated machines or processing lines, production is at a very high level. Therefore, when these lines are stopped for only a brief period, this time becomes very expensive primarily due to the loss of production and not to the cost of maintenance.

By R. L. Kirkpatrick,

*Manager Maintenance Sales Department
Westinghouse Electric Corporation
East Pittsburgh, Pa.*

This has meant that preventive maintenance programs are a "must" and should be considered as a part of the cost of production rather than an unnecessary expense item. A good program prolongs the useful life of electrical equipment and will contribute greatly to increased production and quality.

For example, a chemical plant with 6000 motors, mostly under severe operating conditions, reduced motor burnouts (and production stoppages) from 140 per year to an average of 16 per year—0.27% of the total number of motors.

By sound maintenance practice a metal working plant with 1300 motors, ranging from $\frac{1}{4}$ to 500 hp, reduced motor failures by 25% and bearing failures 50%.

Another large plant made a substantial saving of 75% of lubrication costs, through properly scheduled lubrication.

A chemical producer proved that preventive maintenance paid by considering only the reduction of down time and lost production under the former system.

Manufacturers Can Help

Equipment manufacturers can solve some of the problems by being aware of the factors that are emphasized by automation:

1. The manufacturer of equipment or devices that are part of an automatic machine or processing line must now, more than ever, design trouble-free apparatus.
2. The equipment or devices must require the minimum of attention and give long, reliable service.
3. Equipment or devices must be designed and assembled so that the units or parts can easily be replaced.

4. All devices requiring maintenance must be readily accessible.

5. Manufacturers should supply adequate operation and maintenance instructions.

6. Manufacturers should recommend units or parts to be carried in stock to assure as nearly continuous production as possible.

In addition to these responsibilities of the manufacturer, the operator of the automatic machines must do the following:

1. Must establish a preventive maintenance program which will insure continuity of production.

2. The days of the screw driver and plier type of maintenance man have long since past. A training program must be instituted, since most automatic systems are complex and have many new devices with which older maintenance men are not familiar.

These new devices include many electronic devices and the maintenance man will require training to understand not only these devices but the complete system, so that he can quickly correct trouble.

Down time for repair is too valuable to rely on usual repair techniques. A new procedure in repairing automated equipment is to replace a complete unit and get the machine or processing line in operation. Later, the unit is repaired and replaced for stock.

3. Inspection is the key to a good preventive maintenance program. A detailed inspection schedule must be established specifically stating—when, what, and how inspections are to be made.

What To Look For

Inspection instructions and training courses should tell what to look for and what to do, when certain things are found. Some of these are:

A. Look for accumulation of dust or dirt; keep it clean.

B. Look for presence of moisture which may result in mildew or fungus growth; keep it dry.

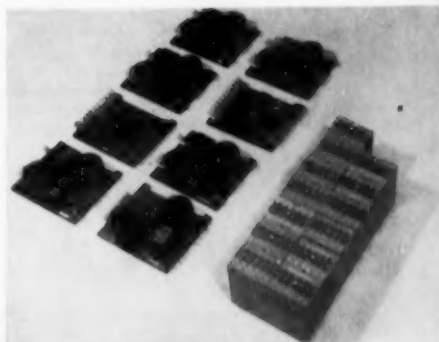
C. Look for loose or nearly broken connections which may be evident on visual inspection or indicated by discoloration at the joints; keep it tight.

D. Look for the results of excessive vibration, such as loose connections or loose mountings. If and when found, determine the reason for vibration and take prompt action to correct it.

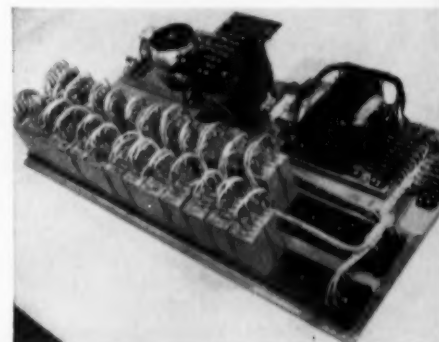
4. Safety is important and, therefore, safe procedures should be established and followed. In many electronic circuits, dangerous high voltages are employed. Power should be off, capacitors should be discharged, and circuits grounded before workmen are allowed to touch them.

The best preventive maintenance program that can be afforded will not prevent an occasional failure. Trouble spots must be located and corrected quickly to save time and money.

Records play a very important part in any preventive maintenance program. These records must be tailored to the specific operation. Size and complexity of the operation determine what records are re-



AUTOMATIC CONTROL elements should be designed to use simple circuits. This photo shows a comparison of the number of circuits required for a hypothetical magnetic, contactless, automatic Cypak static control system. Thirteen single-function elements (right) perform the same control mission as 16 circuits in each of 8 previous elements accomplished.



RUGGED AND COMPACT control panels for Cypak modules can be assembled on preformed busbar power channel base that permits easy replacement and insertion of individual units. These units, with associated power supply, are used for automatic control operations.



TRAINING COURSES and schools for customer engineers are conducted by many manufacturing companies. This group spent a week studying various engineering developments, including the fundamentals of control systems and potential applications for their own industrial processes. These men later installed and serviced the systems so studied.

quired and what records can be kept economically. In general, these should tell the following:

1. A list of the equipment or devices in use.
2. Their function.
3. Their importance in connection with the production output.
4. Frequency of inspection.
5. History of failures.
6. Cost of repairs.
7. Whether unit is repairable or must be replaced.

These records, in addition to the above, should determine what parts of components should be carried in stock to prevent down time and loss of production.

Investments in automatic systems and processing lines make good maintenance a "must" to keep production and quality at a high level.



CHECKING PLANS and electrical specifications of Terrace Lake projects are: (L to R) Clovis Rice, Jr., Twin City Electric Co., Inc., and Kent McElhaney, Terrace Lake Building Co., Kansas City.

Use Wiring Devices to

SELL-UP RESIDENTIAL WIRING

Kansas City electrical contractor uses switch sales-kit to convince builders that quality wiring devices add "sales appeal" to homes.

AT LEAST one Kansas City electrical contractor has found a way to make a better profit per residential wiring job, to sell the next job before the existing one is completed, and to make builders and home buyers happy by "selling up" home wiring. Twin City Electric Company believes that good wiring makes an important sales point and uses a switch sales-kit to convince project builders that quality wiring devices can add "sales appeal" to the homes they offer the public.

Like many contractors, Twin City faced the universal problem of selling good wiring in the highly competitive home market. Both builders and prospective home buyers "shop around" to a considerable extent. The builders shop electrical contractors to get the "best price". Home buyers shop builders to find a home that will become their heart's desire. The net result is that both builder and buyer overlook quality when discussing wiring.

Few home buyers have the engi-

neering inclination to evaluate the wiring as is the case in industrial projects. The prospective home buyer seldom sees anything except the wall switches and perhaps he counts the outlets and looks at the service entrance equipment. The rest of the wiring system is hidden in the walls and he forgets about it.

Why not capitalize on this and put quality and sales appeal into the electric wiring devices that a home buyer does see? That is the premise on which Clovis Rice and



ADEQUATELY WIRED homes in the Terrace Lake project in Kansas City feature noiseless wall switches that glow in the dark. Quality features like this make these homes a salesman's dream.

his son, Clovis, Jr., built the Twin City promotional campaign. Give the home builder a wall switch, or outlet, to which he can point with pride as he talks to the prospective buyer, like he does with the automatic washer or other built-in electric appliances. Give him an appealing, yet hard-hitting, talking point about the quality of his wiring.

The first step in Rice's promotional plan was to convince the project builder that quality wiring devices could help him sell his home; that this would be an added "plus" feature. To do this, Clovis and his son armed themselves with literature and went to work with two Roto-Glo sales kits containing

various switch samples from which the builder could make an easy selection.

During their visits with builders the Rices talked quality, unique application and operation, attractive appearance and the use of color. With the kit, builders could visualize, by comparison, what the different styles and colors would look like in their houses. The final "convincer" was the fact that, with this type of switch in his homes, a builder could offer prospects a house that featured built-in quality.

One of the project builders who "bought" the idea of selling-up wiring devices to home buyers was the

Terrace Lake Building Company in Kansas City. They have outfitted their 300-home project, Terrace Lake Gardens, with Roto-Glo switches. According to Terrace Lake sales manager, Kent McElhaney, prospects displayed a genuine interest in the wall switches when told about them by the salesmen. In most instances it is the "finishing touches" denoting quality that help sell houses.

Twin City Electric has found that most residential construction requires competitive grades of building material due to the highly competitive methods of building operations. Higher grade, quality items can be sold. According to Mr. Rice: "The switches that are different are not affected by competitive offerings, and actually aid in selling a quality job. New interchangeable devices help control costs and effect economies not possible with old-fashioned multi-gang assemblies." He pointed out that the screwless terminal feature on switches and receptacles is an important time-saver from an installation standpoint.

Commenting on his success in selling quality wiring, Mr. Rice made this summation: "Our aim is to help the builder sell-up wiring to his prospects. We try to assist him by furnishing and mailing consumer sales literature, provide display signs for his show houses and advertise in his sales brochures. Getting builders to accept new ideas in electrical systems has been worth all our efforts.



SWITCH DEMONSTRATION with aid of sales-kit is made by Clovis Rice, Jr., (left) vice president of Twin City Electric Co., Inc. Kent McElhaney, sales manager, Terrace Lake Building Company, liked the quality wiring device idea and featured it in his 300-home, adequately wired project.



ATTENTION-GETTERS are these "different," glow-in-the-dark, silent wall switches supplied by Twin City for the Terrace Lake homes.



J. W. CAVATAIO is justly proud of his modernized repair shop built on service and satisfaction to customers.

EXPANSION FOR BETTER SERVICE

... is the growth story of Illinois Electric Works at East St. Louis. Modernization involved a series of structural additions and acquisition of new equipment.



PRESENT PLANT grew, section by section, from the original 20' x 40' building into this impressive, roomy electrical service structure with shop area in the rear.

YOU can't afford to stand still in the electrical business. If you and your customers are to benefit, you have to keep in step with industry growth. The electric motor repair shop is no exception. It must offer the service facilities required by an expanding economy. That, in capsule form, is the philosophy of J. W. Cavataio, president of Illinois Electric Works, Inc.—a firm that has become an important service factor in the Greater St. Louis and southern Illinois areas.

In fact, expanding for better customer service has been a continuing phase of Cavataio's business operation. From the time he and the late Elmer Lusk and two others founded the business back in 1931, their repair plant grew like Topsy. A year after they

started in a 20-ft by 40-ft structure, they moved to a 30-ft by 60-ft building across the street. Soon after, a 30-ft by 30-ft addition was built to give more elbow room. This 1308 Missouri Avenue address comprised the nucleus around which their present plant took shape.

In 1939, a ten-year expansion program began. During that period, four 30-ft by 60-ft sections were added to the original building. Even then, modernization for more efficient service was uppermost in Cavataio's mind. The next three years (1949-1952) were spent visiting shops in major cities in the United States. Layout, equipment and service techniques were catalogued and dovetailed into I.E.W.'s operations. As a result, two more 60-ft by 60-ft additions were built, including a two-story office area. The last was completed in 1954.

As of now, the physical plant includes a 60-ft by 120-ft shop and a total of 30,000 sq ft of combined area incorporating air-conditioned offices, display and storage room.

Space was not the only consideration in the modernization plans. Safety, pleasant working conditions and shop efficiency rated high in the expansion program. Safety doors and masonry walls protect warehouse and office areas from shop hazards. In the shop, spray booth, dip tank, bake oven and similar hazardous equipment are well vented to the outdoors. Equipment handling is simplified by a hoist system and dolly-type tables.

A light, airy atmosphere surrounds shop workers. Walls are painted aluminum to reflect natural and artificial light rays. Equipment stands out in its bright yellow colors. A contrasting green covers work benches. The combined effect is to "liven up the place" and eliminate the black and drab appearance associated with many shops, according to Joe Cavataio.

Efficient shop operation hinges on good equipment, and I.E.W. has plenty of that. Among the latest acquisitions spotted throughout the roomy shop are new winding and tape machines, a high voltage tester, and a lathe and milling machine to mention a few. When occasion demands, others will be added.

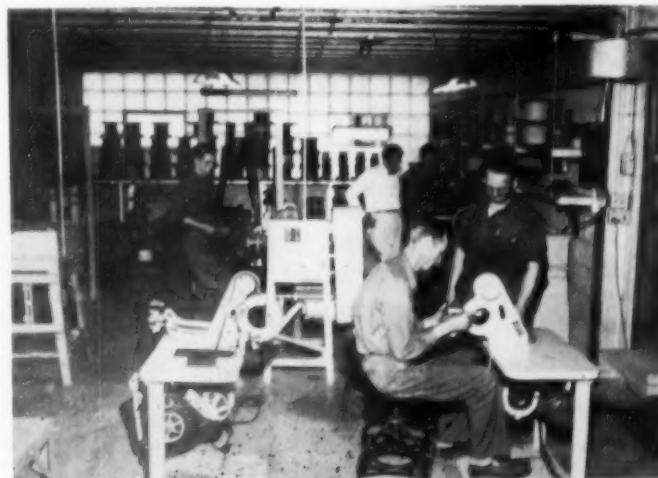
Along with growth, came a natural departmentalization at I.E.W. At present, the firm has three main divisions: (1) Service;



LIGHT AND ROOMY interior is a feature of the new shop areas. Elimination of crowded conditions increased efficiency.



OVERHEAD HOISTS and dolly-type tables simplify material handling and take the drudgery out of moving heavy motors.



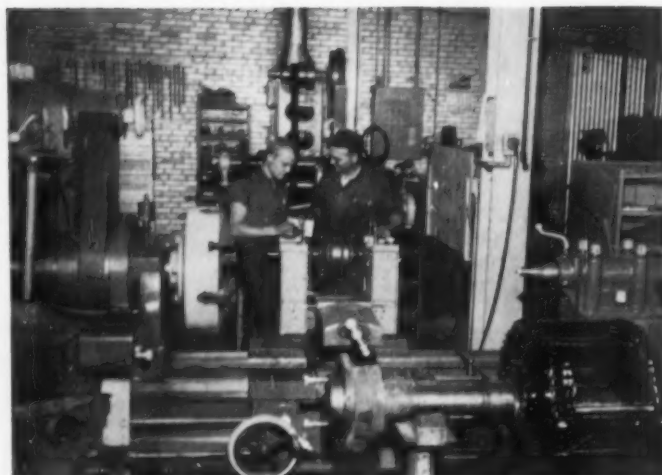
NEW TAPING MACHINES and winding heads in spacious coil department. All equipment is painted bright yellow.

(2) Industrial Sales; and (3) Wholesale Refrigeration and Air Conditioning. In 1954, a wholesale electrical supply section was added "to provide customers the opportunity to purchase their electrical materials locally."

The firm's past and future growth are predicated on "Service". A typical example recounted by service manager Sam Cavataio: Shortly after a call from an industrial plant struck by lightning some 20 miles away, I.E.W. men were on the job checking all motors, cutting coils out of grounded units for quick return to service. One 300-hp motor had to be brought back to the shop and completely rewound. By round-the-clock work, the firm had it back in the plant and in operation in less than three days.

Compared to the original four men who founded the organization, there are now 30 people connected with service. Of these, 26 work under Sam's supervision in the shop. He also is responsible for the purchase and sale of used equipment. New motors are an industrial sales activity.

Strict adherence to their slogan "Service and Satisfaction" has become a foundation stone in the growth of Illinois Electric Works. With their modernized shop and new repair facilities J. W. Cavataio and his associates aim to keep their organization "a service institution."



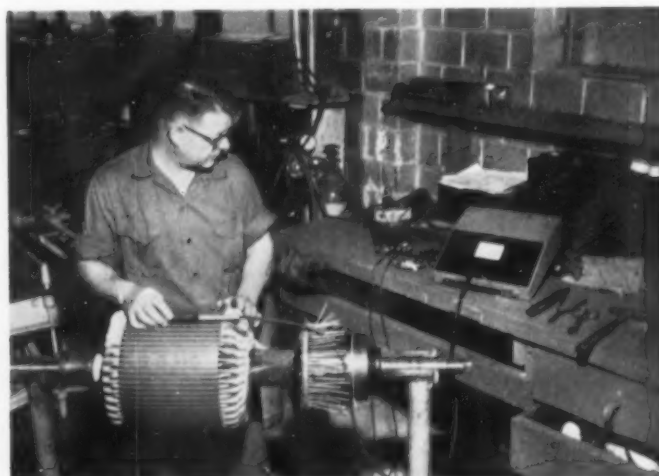
MACHINE SHOP facilities comprise an important segment of the service equipment. Mechanics are checking a rotor on a dynamic balancer.



INITIAL TEST on an adjustable speed motor in for repairs is supervised by service manager Sam Cavataio (right). Repaired motors are given dynamometer test before going to shipping department.



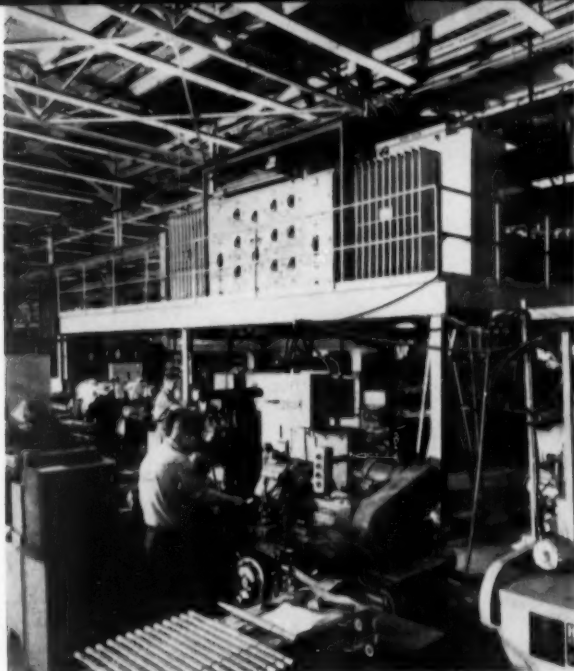
SUNKEN DIP TANK is both safe and convenient. Jib crane with electric hoist lowers and raises heavy stators.



MOTOR COMPONENTS are thoroughly tested before assembly. Here, a rotor for an elevator motor is checked with instrument on bench.

INVESTMENT IN DISTRIBUTION

Part One*



BALCONY-MOUNTED double-ended unit substation makes vital but often-overlooked contribution to production by delivering safe, reliable, full-voltage power through short feeders; by providing coordinated protection against possible short-circuit currents and other abnormal conditions; by furnishing alternate routes for carrying power to essential loads; and by contributing to the flexibility and expandability of the load-center system of which it is a part.

Modern electrical equipment—for new construction, modernization or expansion—can:

- 1** Reduce risks of production shutdowns and damage,
- 2** Contribute to overall company profits,
- 3** Provide flexibility and capacity for change and growth, and
- 4** Protect equipment and employees from injury.

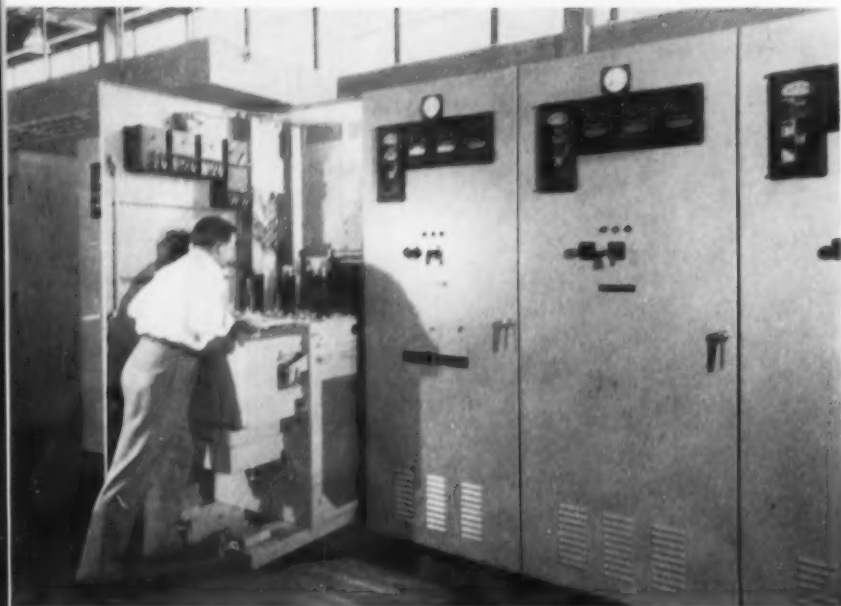
BECAUSE industrial power distribution systems are practically silent and motionless, they are frequently overlooked or underrated as active and integral components of production. Without power, however, the finest electrified production equipment would be useless; so, in effect, distribution sys-

tems supply one of industry's most essential "raw materials".

It is generally acknowledged that a distribution system carries power to loads, yet it should likewise be stressed that the function of a properly designed system is to deliver power *reliably* for production continuity, at *full voltage* for maxi-

mum production efficiency. It also *protects* itself, and all the electrified production equipment it serves, against damage from short-circuits, overload and other abnormal conditions. It also provides maximum protection for *employees* against electrical hazards, and it provides *adaptability* to reduce the time and cost of production layout changes and future expansion. These and other contributions—going far beyond the minimum requirement of merely carrying power to loads—

* First of a 2-part discussion designed to aid plant engineers, electrical contractors and consultants in determining power investments that will best serve specific conditions and purposes. Approaches are suggested for evaluating various returns which possible capital outlay for power distribution will yield.



MODERN SWITCHGEAR minimizes effects of short circuits and other abnormal conditions. An extra investment for high-quality equipment, with forward-looking IC ratings and versatile protective ability, yields high returns. Such equipment provides an extra margin of reliability, protection and safety, over a long service life.

offer unusual opportunities for high-return investments.

From an investment viewpoint on capital outlays, the returns that enter into distribution investment decisions can be divided into four general groups, each group calling for different investment analysis and judgment. The groups are (1) reduction of risk of total or partial production shutdowns and equipment damage, (2) predictable contributions to annual profits, (3) reduction of future capital outlays and costs for system expansion and plant layout changes, and (4) increased employee safety.

The area of investment opportunity in Group 1 is in the nature of paid-up preventive insurance to minimize the risk of costly shutdowns or damage. Even where the distribution system is fairly old, serious shutdowns and damage from electrical causes are usually infrequent. That possibility is a real one, however, and management would generally agree that investment in risk reduction is at least a partial justification for modernizing an old system, or for considering more than bare necessities in a new plant or addition.

Direct contributions to profit is a good way to evaluate electrical equipment, so it can be shown as a Group 2 possibility that a modern

power distribution system can often cut costs of production, improve quality control and increase total annual production by improving voltage control or other system characteristics.

Returns under Group 3 possibilities are, in effect, deferred contributions to profit, for a moderate extra investment in strategic parts of a system (such as switchgear and busways) can remove bottlenecks to expansion and flexibility. The investment decision in this area involves weighing the size and certainty of anticipated immediate and repetitive improvements and savings against the disadvantages of tying up equivalent amounts of capital that will make no contribution to profit for several years.

Group 4 decisions recognize the fact that employee accidents can be very expensive, yet attention to safety should also be assumed as a basic matter of human values, standards of professional management and corporate responsibility.

In considering these various possibilities for investment, the problems related to old and new systems are quite different. For example, an old system may be risky, inflexible, inefficient, costly to maintain and below par in safety, yet a replacement investment generally has to be justified by tangible proof of

increased reliability, savings and safety. With an entirely new system these decisions are automatically decided by the fact that a large part of the investment is related to the absolute necessity of having to deliver power to utilization equipment. Since no already-installed method exists, no investment judgment is required in the decision that money has to be spent to carry power to new loads. In these cases, investment analysis begins only when possible investments provide more than bare-minimum advantages.

1—Minimize Shutdowns and Damage

Even where shutdowns of production from electrical causes are rare, and serious partial outages are infrequent, they still constitute an expensive possibility. Therefore management is realizing that risk reduction is a major consideration whenever investments in distribution are involved. In fact, this is often the critical factor in deciding when or how extensively to modernize an old system, and it also affects the size of investments for systems in new plants or additions.

Modern power systems with adequate protective provisions can reduce risks of outages almost to the vanishing point, protecting distribution components and utilization equipment alike from damage due to overvoltage, overcurrent, short circuiting and other abnormal conditions. Therefore an industrial plant that is trying to get by without such protection may be jeopardizing company earning prospects and investments.

In considering risk-reduction returns on proposed power distribution investments, management should consider (a) possibilities of production shutdowns and equipment damage, (b) penalties if possible shutdowns and damage do occur, (c) examples that show what can happen, (d) trends, such as automation, that are constantly increasing the penalties of shutdowns and damage, and (e) the place of risk reduction in decisions involving distribution investments.

The range of information that might be developed under each of these headings is a wide one, but the greater the volume of data is, the more judicious will be the decisions affecting plant distribution changes, additions and improvements.

a) Shutdown Risks

Of course, if your present distribution system has been causing trouble, this history is highly pertinent, for past trouble is nearly always conclusive evidence of possible future trouble. It is true that many sources of trouble may never become serious, and the interrupting capacity may not be called upon for years to clear short circuits; yet the possible explosion of inadequate devices is an ever-present hazard not only to production continuity but to plant equipment and employee safety as well.

Some of the more usual risks include:

The possibility of faults in distribution conductors and transformers. Here, inspection and "Meggering" of old cable and transformers can furnish objective evidence of the degree of fault risk from deterioration of insulation and other causes.

The risk of faults in distribution systems or utilization equipment resulting in widespread dropping of loads and equipment damage. The possibility of excessive damage can result from (1) Inadequate interrupting capacity in either primary or secondary circuits. Laboratory tests and actual industrial experience has demonstrated repeatedly that inadequate IC is a risk too serious to tolerate. (2) Lack of selective tripping and back-up protection; for, if faults in motor windings and other utilization equipment are not quickly interrupted by the protective device nearest the fault, the short-circuit current can cause extensive damage and also trip breakers that will drop other loads. (3) An ungrounded system, which can cause steady-state or transient overvoltages. For example, transient overvoltage from the repetitive restriking of ground faults can be very damaging to motor windings and other electric equipment.

The risk of damage to utilization equipment in the absence of adequate protection. This protection should be against overload, overvoltage, undervoltage and other abnormal conditions.

Lack of alternate routes of power to serve critical loads. This might entail the risk of having to drop those loads if there were a forced outage in the parts of the distribution system that normally supply them.

Like the outbreak of fire, the



INADEQUATE IC can lead to extensive damage, as shown dramatically by this burned-out panelboard. Conversely, modern panelboards with high interrupting capacity can virtually eliminate the possibilities of dangerous and costly accidents like this. In addition, modern equipment is far easier to maintain.

exact occurrence of production shutdowns and equipment damage cannot be predicted. But, if management understands *why* shutdowns and damage are possible, and realizes fully what the penalties can be if they do occur, they will be aided in reaching a better and more-informed decision concerning distribution investments.

b) Possible Penalties

To an important degree, managerial judgment concerning risk-reduction values of distribution investments will depend on an answer to this question: If possible shutdowns do occur, how much could they cost in dollars and other penalties? As sub-heads to this general question, the following points should be considered:

In event of a shutdown, can lost production be made up? Lost production reduces total sales and, since many costs go right on during a shutdown, profit penalties are incurred rapidly. These profit penalties amount to the summation of all non-productive costs that continue, plus the profit margins that lost production would have brought in. These losses, in plants such as steel mills or automotive assembly factories, can amount to thousands of dollars per hour.

If lost production can be made up, what added costs will have to

be incurred for overtime or for other reasons?

Does a forced outage involve costly shutdown and start-up procedures? In the process industries in particular, forced shutdowns may cause extensive damage to production equipment and entail expensive reconditioning work. For example, glass, metal, plastics and other solids that are processed in the liquid state may solidify during an outage with disastrous results.

What penalties in the form of wages will result from idled workers? Assuming that wages do not halt the moment a shutdown occurs.

Are there other plants depending upon a steady flow of products from your plant?

Would shutdowns disrupt receiving and shipping schedules? That is, would they disrupt the flow of products from suppliers or to your customers?

What would shutdowns do to good will? This refers not only to employees, customers and suppliers, but to the plant community as a whole.

c) Examples of Damage

Examples to illustrate the serious extent to which trouble can develop are numerous. For example: A mid-western chemical company with a relatively large power system had three turbine-generators tied to one

2300-volt bus. Old switchgear consisted of oil-filled circuit breakers with ordinary disconnects and inadequate ICs, but modern switchgear had been ignored because "no serious failure had ever occurred." Luck finally ran out with the occurrence of a short in a feeder cable. The high short-circuit caused the disconnecting switch to blow open. At about the same time the oil circuit breaker tried to interrupt the short-circuit, but it failed and blew up, spraying molten copper and burning oil over the switchboard. The switchboard was out of service for 16 hours as a result and, to effect complete repairs, the plant was shut down even longer.

In another instance, a motor-winding fault caused an old oil switch to blow up and spray burning oil over a considerable area in a flour mill. The resulting fire destroyed the plant completely, resulted in losses amounting to sev-

eral millions of dollars, and, since the plant was never rebuilt, the loss was a permanent one for the community.

d) Trends That Increase Penalties

Production shutdowns and equipment damage are constantly becoming costlier, as illustrated by the following facts:

Profitable operation of industry is depending increasingly upon orderly, scheduled completion of "blocks" of production. There is a growing inter-dependence between production lines within a company and the production flow of suppliers and customers. Therefore interruptions of these inter-related flows are becoming costlier to all concerned.

Stoppage of any part of a production line now stops the whole line. This is becoming increasingly true as automation, motorization and mechanization increases.

Operating equipment cannot be

"furloughed". From receiving through production to shipping, plant operations are being done more and more by machines representing larger investments in capital goods. When production is tied up, therefore, this capital remains idle—and the cost of this capital equipment is on the rise constantly.

e) The Place of Risk

Risk reduction enters into investment decisions concerning every aspect of power distribution, yet there are some areas in which risk reduction is a critical consideration; a consideration that can dictate the justification for additional investments beyond the bare minimum needed to deliver power to utilization equipment.

Such additional investments (which can be justified mainly on the ground that they reduce risk of shutdowns and damage) include:

Extra cost of high quality equipment, with built-in reliability that will consistently reduce risk throughout the whole system.

Entire installed cost of coordinated protective devices of adequate interrupting capacity.

The cost of system grounding transformers or resistors, if needed for system-neutral grounding.

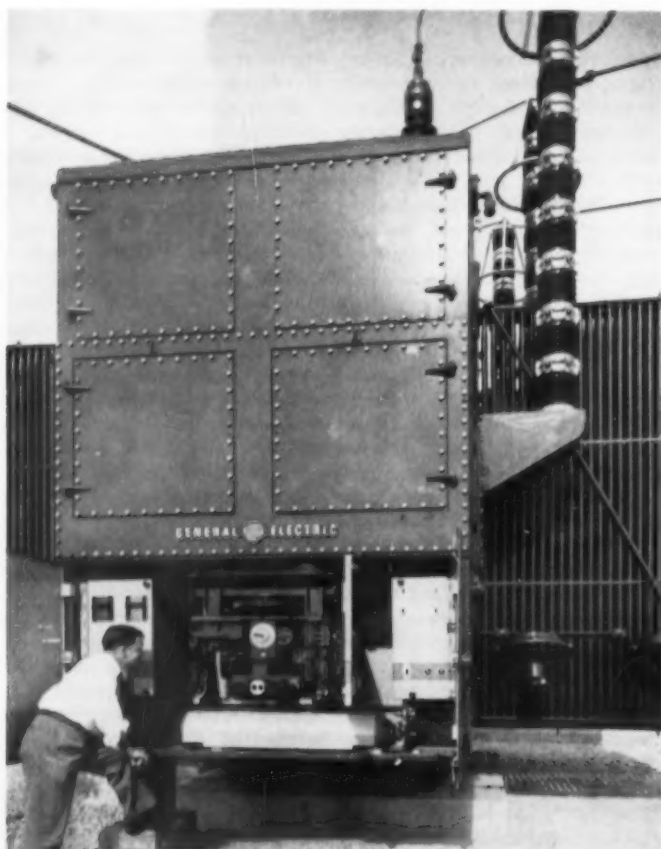
The 10 to 15% extra investment required for a secondary selective system, where there are highly critical processes that justify provision of alternate routes of power.

Risk reduction largely justifies the extra investment for equipment of high quality, for good system design and correct application backed by high-quality components results in minimum failure rates. This reliability of quality products now extends to such fields as transformers, cables, circuit breakers, busways, capacitors, voltage regulators and scores of other system components. Therefore, practically all of the extra investment required for careful system design, high-quality equipment, protective systems and grounding can be justified as a prudent investment in a "paid-up policy" for preventive insurance.

II—Contributions to Profits

The second group of benefits related to the application of modern electrical equipment pertains to *predictable* yearly contributions to profit which *additional* investments make possible. Some of these possible contributions include:

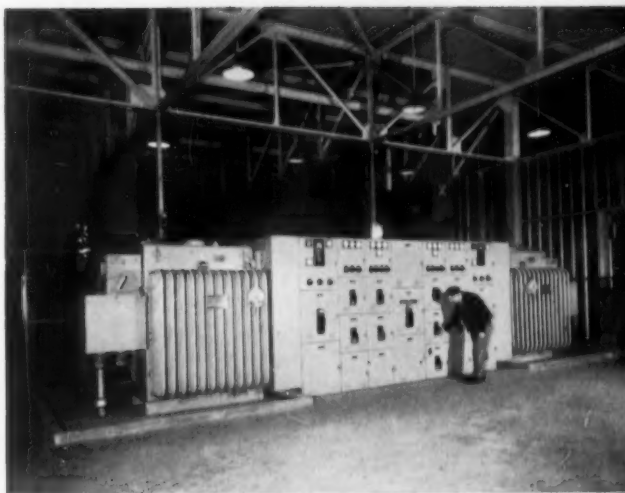
a) Cutting Production Costs



VOLTAGE REGULATION equipment can yield attractive contributions to annual profits. Where incoming voltage varies widely, load-tap-changing equipment can be incorporated in the main transformer to keep voltage spread within desired limits throughout the plant.



POWER FACTOR correction and resulting power-cost savings can be realized by installing capacitors such as the one pictured above. Moreover, these units can reduce system losses and release system capacity for other productive applications.



LOAD-CENTER UNIT SUBSTATIONS make distribution systems flexible, expandable, reliable, easy to operate and maintain. Short feeders reduce voltage drop. Metal-enclosures, interlocks and drawout switchgear improve safety.

This is possible by increasing system flexibility or production efficiency, effecting savings in maintenance or power costs, obtaining capital interest and depreciation savings.

If production setups undergo frequent rearrangement, flexibility of a load-center system with plug-in busways can produce sizable savings, and these changes will normally keep pace with technological advances and the development of improved products and processes. Moreover, good voltage conditions contribute to increased production efficiency by insuring the continuity of rated performances. Therefore, motors, voltage-sensitive control and instrumentation, electric heating equipment, lights and other utilization equipment can all make their designed contributions to production output. These contributions can result in a higher rate of production (which spreads costs over more units), closer quality control (which saves material and reduces rejects), and fewer interruptions of production from excessive voltage variations. Still other contributions to production efficiency may include simplicity and ease of operation of the system, and reliable operation of properly coordinated protective systems.

Also, a modern distribution system requires less maintenance, and modern equipment design greatly

facilitates the maintenance that is needed. Moreover, the system protects both distribution and utilization equipments against unexpected damage that would increase maintenance costs. Quick clearance of faults, undervoltage and overload protection can also reduce overall maintenance costs. In addition, good voltage conditions reduce lamp burnouts and replacement costs, and prolong life of equipment insulation and windings.

Of course, the many well known methods of reducing power-factor and demand charges usually yield attractive savings, while reduction of overall system losses in an old installation should be still another favorable argument in favor of modernization.

Finally, capital interest and depreciation savings can be effected by adding small unit substations as a modern load-center system is gradually expanded, thereby keeping to a minimum the amount of capital tied up in unused system capacity. These lowered capital outlays naturally reduce annual interest and depreciation charges.

b) Increase Product Values

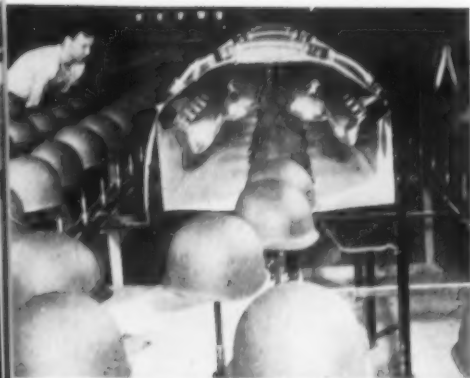
By contributing to closer quality control, a good distribution system not only cuts unit costs but helps to produce products of higher and more uniform quality. For example, in heat-treating of metal parts, voltage may be stabilized to insure de-

sired consistency of parts. In other cases it is possible to estimate how much power distribution can contribute to annual profit by helping produce products of greater value.

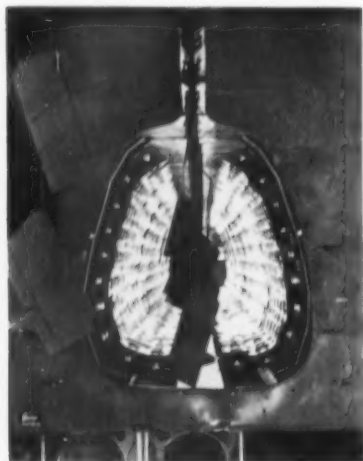
c) Increase Production

Increased production not only cuts unit costs by spreading overhead costs over more units, but it contributes to annual profit by increasing the amount of salable products. If it is possible to show that a proposed power distribution investment will result in increased production of salable goods, therefore, the profit margins represented by the increased sales are a contribution to annual profit for which the distribution investment can receive major credit.

Since plant engineers and maintenance men are members of manufacturing management, this discussion is aimed at helping them develop information needed to determine power distribution investments which will best serve their company enterprise as a whole. The various approaches herein mentioned are suggested for evaluating various returns which possible capital outlays for power distribution will yield. Benefits or returns from possible power distribution investments may vary widely from plant to plant, yet the specialized data that only an electrical engineer can correctly interpret should be of use in evaluating investment risks.



INFRARED LAMPS in specially designed baking tunnel insure fast, thorough drying of paint on helmet liners used by the U. S. Army.



ARRANGEMENT of lamps and reflectors can be altered to meet specific heating requirements of variously shaped and coated products, as indicated by this odd-shaped oven installed in the White Motor Company plant in Cleveland.

Design Data for . . .

INDUSTRIAL INFRARED APPLICATIONS

Calculations for estimating heating requirements in Btu's or kilowatts per hour or per square foot) for heating metal to predetermined temperatures, evaporating liquids, drying paints or other surface finishes. Design of ovens, characteristics of infrared lamps and reflectors, methods for control and theories of heating are also discussed herein.

By J. C. Hoffman,

*Lamp Division
Westinghouse Electric Corp.
Bloomfield, N. J.*

THE transfer of heat may be accomplished in three ways: conduction, convection, and radiation.

Conduction refers to the molecular action within a body or from one body to another. This principle, almost invariably, applies to materials of set dimensions, particularly conductors of heat.

Convection is the transfer of heat by gases and liquids. The application of heat causes an expansion of volume with a consequent lowering of density. The low density particles, being lighter, rise, giving off their absorbed heat as they do so.

Radiation is the transfer of heat by means of certain electro-mag-

netic waves. One of the most efficient methods of producing the desired wave length is through the use of infrared heat lamps.

The advantages of infrared are far-reaching and many. Radiant energy does not heat the air but only an absorbing body, allowing for greater efficiency. This eliminates the need for enclosing the infrared oven; thus they may be readily utilized along a conveyor. The oven itself is lighter, cheaper, neater, and far easier to maintain than other types of ovens. Proof of these advantages is seen today in the growing usage of infrared and the phenomenal savings it has incurred.

It is virtually impossible to

formulate necessary data to design a perfect oven. Today, there are scores of paints to be baked, materials to be heated and applications exceeding the imagination. The variables, even in a simple mass heating job, are so numerous that here, all that can be derived are theoretical values. This, however, is not as limiting as might be supposed. Infrared ovens are, and should be, constructed so that an additional section may be installed, or the lamps may be adjusted nearer to or farther from the material.

There are two methods of deriving requirements for a radiant oven. The first method shown estimates requirements in kilowatts or

FIG. 1—Approximate Specific Heat Values of some common materials

(in Btu's per lb.)

Aluminum	.23	Cotton	.37	Paraffin	.69
Antimony	.05	Glass	.12	Platinum	.03
Asbestos	.20	Gold	.03	Porcelain	.26
Brass	.09	Iron	.12	Rubber	.48
Bronze	.09	Lead	.03	Silver	.06
Cadmium	.05	Leather	.36	Steel	.12
Cellulose	.37	Manganese	.12	Tin	.05
Chromium	.11	Mercury	.03	Water	1.00
Cobalt	.10	Molybdenum	.06	Wood	.42
Copper	.09	Nickel	.11	Zinc	.09

FIG. 1-A—Heat of Vaporization of various liquids

	Vaporization Temperature (F°)	Heat of Vaporization Btu per Hour
Liquid		
Acetone	133	224
Amyl Alcohol	268	216
Benzene	176	710
Carbon Disulphide	115	152
Carbon Tetrachloride	170	84
Ethyl Acetate	32	184
Ethyl Alcohol	173	368
Methyl Acetate	32	205
Methyl Alcohol	133	177
Water	212	970

Btu's per hour; while the second method gives requirements in watts per square inch, which is more useful to the experimenter in infrared.

Mass Heating

Perhaps the best explanation of a mass heating task is to present a typical problem.

Problem: Sheet brass is produced at the rate of 1000 lbs per hr. To facilitate punch-press operation it is desired to raise the brass from a temperature of 80° to 180° F. or a total of 100° F.

In order to calculate the required kilowatts it is necessary to know the following:

1. Pounds of material per hr. to be treated.
2. The specific heat of the material.

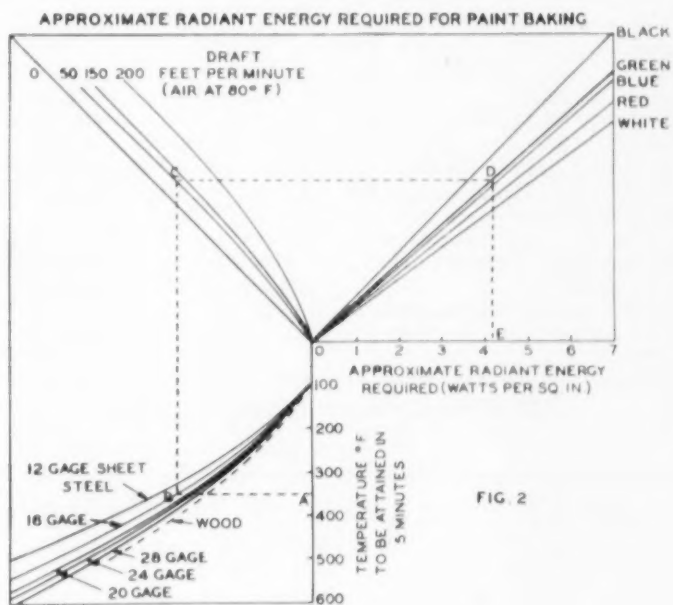


FIG. 2

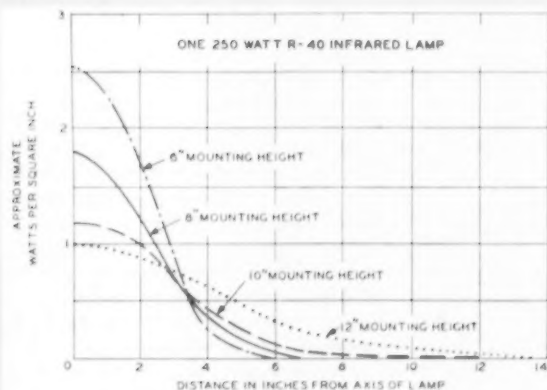


FIG. 3

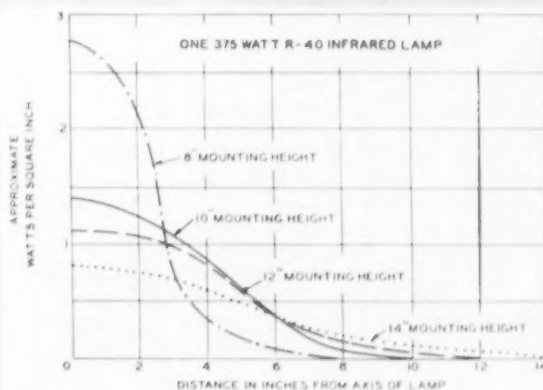


FIG. 4

3. The temperature rise required in degrees Fahrenheit.

Then:

4. $(1) \times (2) \times (3) =$ Requirement in Btu's per hour.

5. To determine kw required, divide Btu's per hour by 3,413.

Solution: Since the specific heat of brass, from figure (1), is .09, the data are substituted in the above formula as follows.

4. $1000 \times .09 \times 100 = 9000$ Btu per hour.

5. $\frac{9,000}{3,413} = 2.6$ kilowatts required.

Liquid Evaporation

With a slight variation the same formula holds for required kilowatts in liquid evaporation. This formula is stated:

1. Pounds of liquid to be evaporated.

2. Specific heat of the liquid.

3. The degrees Fahrenheit temperature rise required to bring the liquid to its vaporization point.

The following formula (5) requires that:

4. The heat of vaporization of the liquid be known in order to

determine the energy required to evaporate the liquid after it has reached its vaporization point.

5. $(1) \times (4) =$ Btu per hour.

Problem: Cloth weighing a total of 16 oz per yd, of which 13 oz is cotton and 3 oz moisture, is processed at the rate of 200 yd per minute or 12,000 yds per hour. The cloth is at a temperature of 200° F when ready for drying. Determine the Btu's necessary for drying.

Solution:

$\frac{12000 \text{ yds} \times 3 \text{ oz per yd}}{16 \text{ oz per lb}} = 2250 \text{ lb of water per hour.}$

$\frac{12000 \text{ yds} \times 13 \text{ oz per yd}}{16 \text{ oz per lb}} = 9750 \text{ lb of cloth per hour.}$

From figure (1), the specific heat of cotton is 0.37 and of water 1.00. The heat of vaporization of water is 970 Btu per hour, from figure (1A). These data are substituted in the foregoing formula (4) as follows.

$2250 \times 1.00 \times (212 - 200) = 27,000$ Btu per hour for raising the temperature of the water from 200 to 212° F.

$9750 \times .37 \times 12 = 43,290$ Btu per

hour for raising the temperature of cotton from 200 to 212° F.

Then substituting in formula (5): $2250 \times 970 = 2,182,500$ Btu per hour for evaporating the water; thus 2,183,500 plus 43,290 plus 27,000 would equal 2,252,790 Btu per hour or the total energy required to do the job.

Dividing 2,252,790 by 3,413, the requirement is found to be 660 kw.

Oven Design Formula

Following is probably the most useful formula to the company who would like to design and build their own oven. Values are obtained in the more usable form of minutes and watts per square inch. However, it should be remembered that unconsidered factors dictate that provisions be made in the final installation for possible adjustments. The formula is:

$$\theta = \left[\frac{(\Delta T)(W)(SH)}{K} \right]$$

Where—

θ = The theoretical radiation time (minutes) per square ft of material.

ΔT = Temperature rise required (°F).

W = Weight of material, lb per sq ft.

SH = Specific heat of the material (Btu/lb °F).

K = Energy in Btu per minute being absorbed on the surface of the irradiated material per square ft (Btu/min).

Introducing this formula in the first problem on the mass heating of sheet brass, the following is derived.

T = 100° rise in temperature required.

W = If we assume that the thickness of the sheet brass is 0.010 of an inch and brass weighs 529 lbs per cu ft, then a sq ft of the sheet brass in question weighs $1 \text{ ft} \times 1 \text{ ft} \times .000833 \text{ ft} \times 529 \text{ lb per cu ft}$ or 0.44 lb per sq ft of material.

FIG. 5—Approximate Energy Recordings

(Watts per sq. in.)

Mounting Height	250 R40 Lamps	375 R40 Lamps
8"	1.9	2.8
10"	1.5	2.3
12"	1.3	1.9
14"	1.1	1.7

Recordings were obtained from a single bank of nine lamps, in a square arrangement, on six inch centers. Reflectors are not used in this case; however, with the use of reflectors in double bank ovens, the above values will increase from 2½ to 3½ times these values.

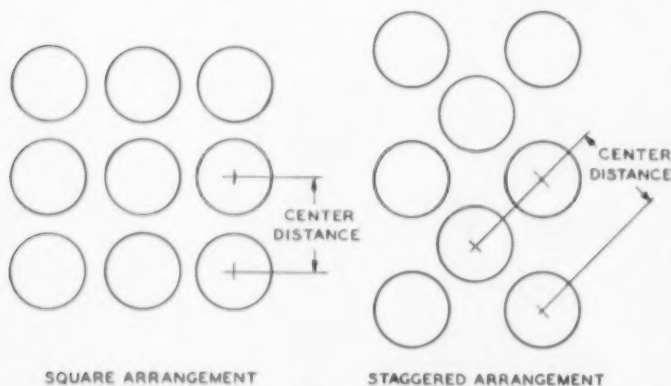


FIG. 6

RELATIVE INFRARED REFLECTIVE EFFICIENCY OF VARIOUS SURFACES

GOLD 98%

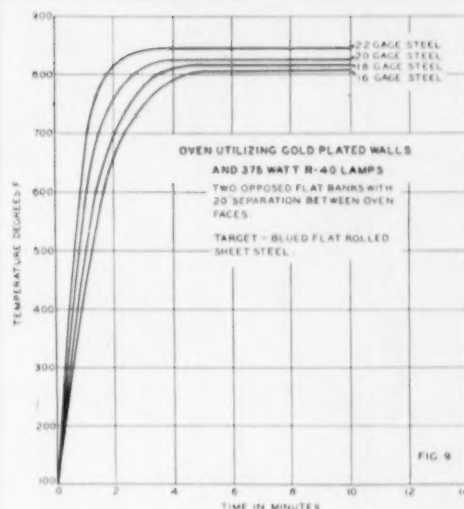
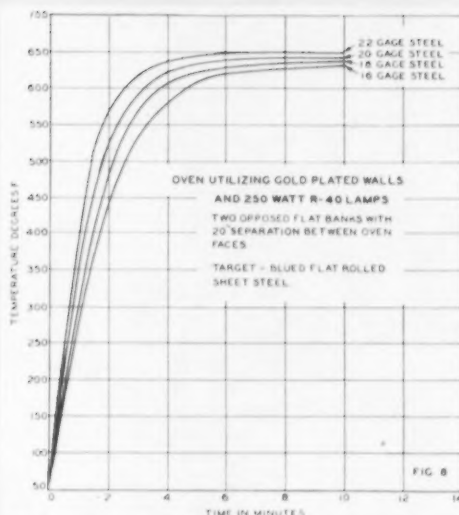
PROCESSED ALUMINUM 85%

POLISHED ALUMINUM 65-75%

CHROME OR NICKEL 60%

PAINTED ALUMINUM 40-50%

FIG. 7



SH = The specific heat of brass from figure (1) is 0.09.

K = Absorbed energy in Btu per minute or the absorbed radiant energy on one square foot surface of the material. 1 watt per sq in. = 8.19 Btu per sq ft per minute or 491.5 Btu per hour per sq ft.

Thus, if an arrangement of lamps will deliver sufficient energy so that 4 watts per sq in. are absorbed on the surface of the material, the arrangement will deliver 32.76 Btu per sq ft per minute. In this case 32.76 Btu per minute is equal to K since we refer to one sq ft of area.

Substituting in the formula:

$$\theta = \left[\frac{(\Delta T)(W)(SH)}{(K)} \right]$$

$$\theta = \left[\frac{(100)(.44)(.09)}{(32.76)} \right] = 0.12 \text{ minute (per sq ft of material)}$$

The brass is fed into the oven at the rate of 1000 lb per hour or approximately 16.7 lb per minute.

As previously determined, one sq ft of the sheet brass weighs 0.44 lb. Therefore, 16.7 lb per min divided by 0.44 pounds would be equal to 38 sq ft per minute.

The assumed oven accommodates 1 sq ft of brass in 0.12 minute.

Multiplying the minutes required to heat the material by the conveyor speed in ft per minute, the length of the tunnel in ft is found. Thus 0.12×38 (this assumes that the oven is one ft wide) = 4.6 ft for the length of the oven.

It is now quite generally recognized that any finish that can be baked at all can be baked with infrared radiation. Of course, as is true of all infrared applications, an exact formula for this service is impossible.

Surface finishes are grouped into four broad classifications—oil paints, lacquers, baking japans, and enamels. Each of these has varying characteristics, and when applied as a finish to a material, any possible formula would have to consider the thickness, kind, and general characteristics of the material, in addition to those of the finish.

Manner in Which Coatings Dry

(1) Evaporation—With the possible exceptions of house paints and artists' colors, all paints contain some solvent that must be evaporated before the actual "drying" starts. In the case of lacquers, aniline inks, shellac, and similar solution coatings, the evaporation of the solvent is the only drying required.

(2) Oxidation—Oil paints, oleoresinous varnishes, enamels, and unmodified synthetics all dry primarily by oxidation; that is, oxygen from the air must be present to react with the unsaturated components of the oils to convert them into the hard, tough material that forms the ultimate film.

(3) Polymerization — Polymerization is the change by union of two or more molecules of the same kind into a compound of the same proportions having different physical properties. This process generally accompanies oxidation and is accelerated by heat.

Baking Calculations

In arriving at the energy requirements for a specific paint baking job it is necessary to know the draft in the oven, the material to receive the paint, the color of the paint, and the necessary temperature to be attained in 5 minutes. This information is frequently supplied by paint manufacturers, but can be readily found by experimentation.

Referring to figure (2), if the above values are known, it is possible to arrive at the approximate watts per square inch required. Of course, this value is again theoretical.

Problem: A piece of 16-gauge sheet steel is to receive a baked finish. The paint requires 350 degrees F to be attained in five minutes. The paint is green and the draft is 50 feet per minute. A line may be drawn, as shown in figure (2) A-B-C-D-E, connecting the known values down to the answer of 4.2 watts per square inch at E. In other words it should take about 5 minutes to bake this finish in an

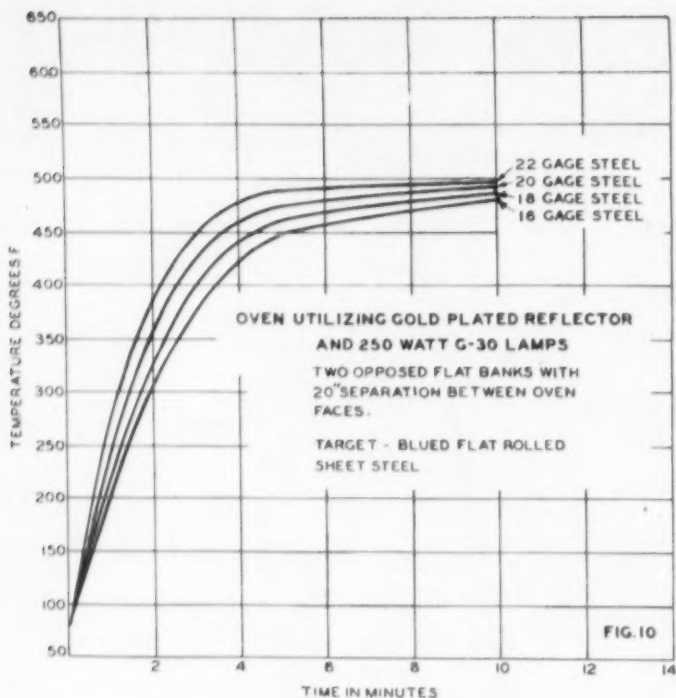


FIG. 11—Infrared Heat Lamps

LAMP	Bulb	Base	Watts	Volts
125G30.....	G-30	Med. Skt.	125	110-125
125R40.....	R-40	Med. Skt.	125	110-125
250G30.....	G-30	Med. Skt.	250	110-125
250R40/1.....	R-40	Med. Skt.	250	110-125
250R40/HR.....	R-40*	Med. Skt.	250	110-125
375G30.....	G-30	Med. Skt.	375	110-125
375R40.....	R-40	Med. Skt.	375	110-125
375R40/1.....	R-40*	Med. Skt.	375	110-125
500G30/1.....	G-30	Med. Skt.	500	110-125
1M/THO/3.....	T-40*	Special	1000	110-125

The following infrared brooder lamps are also useful where even distribution is more important than high energy.

250PS 30.....	PS-30	Med. Skt.	250	110-125
250R40/3.....	R-40	Med. Skt.	250	110-125

* Heat resisting glass bulb.

oven delivering 4.2 watts per square inch to the treated furnace.

Data on Lamps and Ovens

With the wide acceptance of infrared, lamp and oven manufacturers have attempted to supply equipment to meet every desired need. Lamps are supplied in various wattages with built-in reflectors or clear globe-shaped bulbs, as indicated in figure (11). Ovens are equally versatile with various

reflectors, lamp spacings, lamp arrangements, etc.

The following figures, it is hoped, will supplement the preceding formulas in the determination of the correct oven to perform the task.

Figs. (3) and (4) indicate the variations in energy as the distance between lamp and treated surface is increased or decreased. Fig. (5) is also graduated in watts per square inch showing the approximate energy from a bank of lamps

in a square arrangement. The lamps in figure (5) were mounted on 6-in. centers. If the lamps had been mounted on 6-in. centers but in a staggered arrangement as in figure (6), the energy would be increased and a more uniform distribution would result. If opposing banks are used with reflectors, the watts per square inch are more than doubled.

It seems worth mentioning, at this point, that for measuring infrared energy in watts per square inch, a direct reading radiation meter should be used. For temperature readings a thermocouple is most advisable. A thermometer is useless for measuring infrared energy.

Fig. (7) indicates the efficiency of various reflecting surfaces. In Figs. (8), (9) and (10), gold plated reflectors were used and the lamps were mounted in a square arrangement. The actual ovens are the Fostoria 40-000 and 48-000 series ovens.

Electrical Control

For simplicity, lamps may be utilized in series of two on 240-volt circuits and four on 440- to 460-volt circuits. This series connection will eliminate the use of a transformer and may be advisable for minor tasks requiring from one to four lamps. Of course, as is true of a string of series Christmas tree lights, if one lamp burns out the entire circuit will become inoperative and the effective output of the installation will be zero.

The use of a multiple tap transformer is highly advisable for large installations. This eliminates the need for high voltage and provides better control over the wattage and resultant heat output of the lamps. For additional flexibility, a transformer is frequently used to vary the conveyor speed through the oven.

Another method of obtaining control is through half voltage switching. On single phase systems, a simple series parallel switch can produce half voltage across the lamps. On a 3-phase delta system, the center of the delta may be disconnected, leaving four lamps on a 240-volt system or eight lamps on a 460-volt system.

The more popular circuits among oven manufacturers are the 3-phase delta system and the wye or star system.

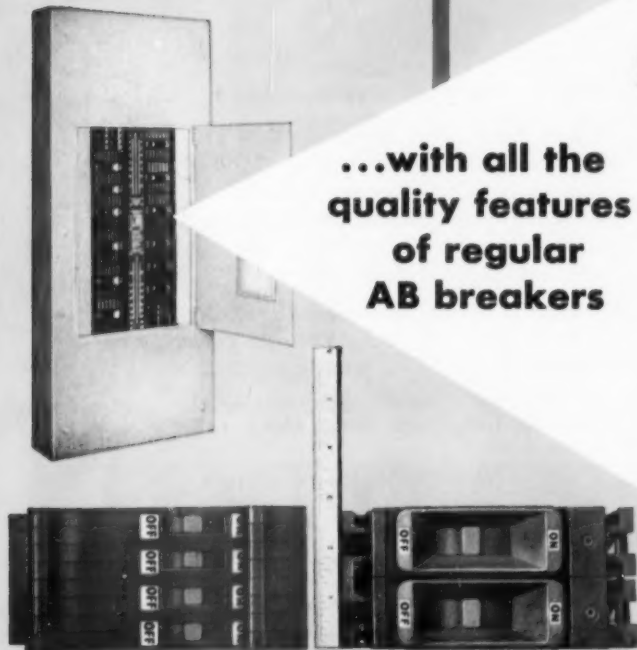
FEDERAL PACIFIC'S ALL-NEW 1 1/16" STABREAKER

**DOUBLES
PANELBOARD LIGHTING
CIRCUITS...**

**SLASHES
PANELBOARD SPACE-COST
REQUIREMENTS!**

Now you can get twice the number of lighting circuits in Distribution Panelboards...without adding to cost...without taking up extra space. And it's all made possible by Federal Pacific's revolutionary new 1 1/16" wide single pole, NE-S frame STABREAKER. Just half the width of conventional single-pole NE breakers...it makes possible twice the number of lighting circuits in the same space. What's more, the cost of this remarkable breaker is considerably less than the cost of regular single pole NE breakers! And to top it all, this dollars and cents savings is in addition to the plug-in flexibility and installation ease common to all STABREAKER devices.

**...with all the
quality features
of regular
AB breakers**



The new 1 1/16" STABREAKER has every basic AB circuit breaker feature. But like wafer thin new watches, the mechanism has been rearranged to conserve width. All the time-tested and proved features have been retained.

For swift, over-the-counter panelboard service . . . get STABREAKER from your distributor's stock.

- QUICK MAKE—QUICK BREAK
- THERMAL MAGNETIC TRIP
- SILVER TUNGSTEN CONTACTS
- CENTER HANDLE TRIP INDICATION

Finest Products Engineered
FEDERAL PACIFIC ELECTRIC
COMPANY

Main Office: 50 Paris Street, Newark 1, N. J.

Plants at Newark, N. J.; Long Island City, N. Y.; Cleveland, Ohio; St. Louis, Mo.; Dallas County, Texas; Scranton, Pa.; Los Angeles, Calif.; San Francisco, Calif.; Santa Clara, Calif.; Emeryville, Calif.; Affiliated Plant, Toronto, Canada.



Edwards specialization is your "insurance" of quality

For more than 80 years Edwards has specialized in the design, development, and manufacture of signaling devices. This wealth of experience in a single field is your "insurance" of quality when you use an Edwards product on any signaling job. For homes, schools, hospitals, business and industry only Edwards offers such perfection of design and operation.

This long specialization in signaling pays you dividends tomorrow as well as today. For when you install an Edwards product, it not only adds a mark of quality to your work, but gives your

customer extra years of uninterrupted service.

All Edwards products are designed for ease of installation and servicing, if required. Edwards technical specialists are conveniently located in 53 key areas in the United States and Canada to work with you in recommending the proper equipment for the job to be done.

To be sure of continuing customer satisfaction for every job insist on an Edwards product, available through your wholesaler. Edwards Company, Norwalk, Conn. (in Canada, Edwards of Canada, Ltd., Owen Sound, Ont.).



FOR HOMES

door chimes
home fire alarm systems
bells, buzzers,
electric accessories,
push buttons • burglar alarms



FOR HOSPITALS

nurses' call systems
(audio, visual)
doctors' paging systems
fire alarm systems
in-and-out registers
psychopathic alarm systems
contact devices



FOR SCHOOLS

clock & program systems
fire alarm systems
bells, horns, buzzers
intercommunication systems



FOR BUSINESS-INDUSTRY

lokator® paging systems
clock & program systems
fire alarm systems
intercommunication systems
burglar alarm equipment
bells, horns, buzzers
executive desk call buttons
contact devices • door openers
annunciators

Specialists in Signaling

Since 1872



DESIGN • DEVELOPMENT • MANUFACTURE

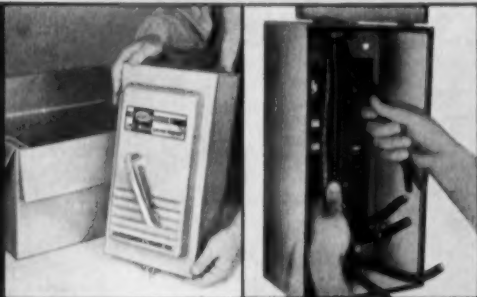
For unequaled ease of AB-I installation...specify

FEDERAL PACIFIC STABREAKER

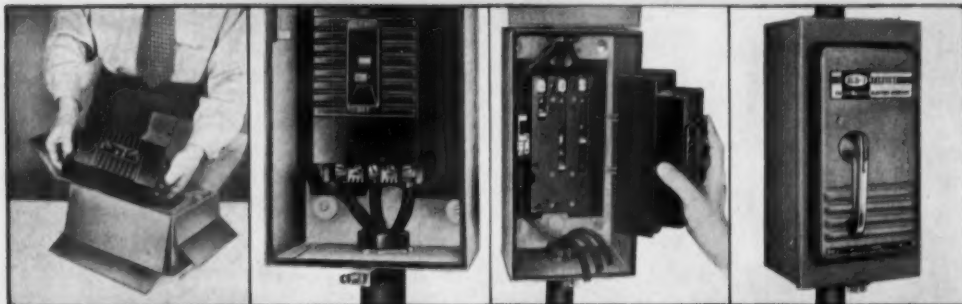
No other development has so greatly simplified the installation of AB circuit protection. It's Federal Pacific's revolutionary new STABREAKER...the circuit breaker that simply "plugs-in" to give you the easiest, most versatile installation possible! By simply adding stabs to its regular line of "NE" "NF" and "NJ" type AB circuit breakers... Federal Pacific makes it possible to "plug-in" all ratings from 15 to 225 amperes in only two general purpose STAB-Inclosures. With STABREAKER's unique "plug-in" installation there's no "blind" fishing for hidden screw holes because the breaker automatically aligns itself when "plugged-in". Bolts through breaker front provide extra holding power. Both the breaker and the enclosure are separately packaged which not only gives you wiring flexibility but minimizes your inventory.



**How to save time
on AB-I
installations**



1. Select one of two standard STAB-INCLOSURES
2. Connect line side wires



3. Select STABBREAKER rating desired
4. Connect load side terminals
5. Simply plug breaker in place
6. And installation is complete

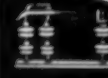
GET OVER-THE-COUNTER DISTRIBUTION PANELBOARD SERVICE WITH STABREAKERS AND PREFABRICATED PANEL ASSEMBLIES DIRECT FROM YOUR DISTRIBUTOR'S STOCKS!

Finest Products Engineered

FEDERAL PACIFIC ELECTRIC COMPANY

Main Office: 50 Paris Street, Newark 1, N. J.

Plants at Newark, N. J.; Long Island City, N. Y.; Cleveland, Ohio; St. Louis, Mo.; Dallas County, Texas; Scranton, Pa.; Los Angeles, Calif.; San Francisco, Calif.; Santa Clara, Calif.; Emeryville, Calif.; Affiliated Plant, Toronto, Canada.



THIS COMPLETE LINE MEETS EVERY NEED FOR PUSHBUTTONS



Name your pushbutton requirement—there's a Square D unit to do the job, exactly. Three complete lines . . . standard duty, heavy duty, and oil-tight heavy duty . . . each providing a wide range of operators, stations, and circuit combinations.

Write for Pushbutton Bulletins which give complete details. Address Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin.



NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY

Practical Methods

Lighting Planned for Flexibility

LIGHTING

The lighting for the new buildings of the Ramo-Wooldridge Corporation of Los Angeles has been specifically studied and planned to aid in the critical seeing tasks encountered in the highly technical research and exacting engineering work carried on by this large and growing electronic firm. This research and work includes the development of systems in the field of guided missiles, fire control, communications, computers, automation and data-processing. Because of constant expansion and the diverse demands made on their services, a prime consideration in building, hence also in lighting, has been flexibility and adaptability to change.

One of the new buildings has suspended ceilings with corrugated acoustical aluminum paneling. The lighting design is based on the use of recessed troffers with ceiling construction which permits modular arrangements, geometric patterns and continuous row installations, all with equal ease. When partitions are moved, lighting can be provided for any size area by simply installing the troffers where desired in the grid ceiling, and by using the corrugated acoustical aluminum panels for closing in the portion of the grid ceiling between the troffers.

In a typical computer room (see



CORRIDORS at Ramo-Wooldridge are lighted to higher-than-usual intensity to provide easy transition from high-level office lighting to corridors, or vice versa.



RECESSED TROFFERS installed in geometric pattern in grid ceiling light this computer room at Ramo-Wooldridge plant in Los Angeles to 130 footcandles. System permits quick change of space arrangement, with flexibility to suit all demands.

photo), an average illumination of 130 footcandles is provided with recessed open-type troffers in a grid-design layout. This room, 65 ft by 29 ft, with a 12-ft ceiling height, contains seven rows of 2-lamp troffers running the length of the room with six 28-ft rows crossing at right angles. Because the console boards placed in this room must be read in semi-darkness, a special switching arrangement has been installed to vary the lighting intensity from the maximum of 130 footcandles to any desired lower level.

This same type of recessed open-type troffer has been used in drafting rooms in continuous rows, while in many general office areas similar units equipped with metal louvers for shielding have been used.

Another important lighting consideration is the lighting of corridors to a higher level of illumination than has been the usual practice. This is done to balance the transition from offices to corridors, keeping the lighting levels close enough to prevent eyestrain in going from one area into the other, by making it unnecessary for eyes to adapt to new lighting levels over a wide range of intensities.

More than 4500 luminaires have been used by this firm in lighting its new buildings, and were supplied by Sunbeam Lighting Co. of Los Angeles. The lighting operates on a 480/277-volt system.

Electric Heat for Milk Houses

HEATING

Electric heat is finding increased acceptance as the answer to the heating problem in milk houses of dairy farms. Heat is required to provide a comfortable working temperature for the handling and washing of milking utensils, to keep water in bulk milk cooling units from freezing during "off" periods, and to reduce moisture, preventing ice from forming on the floor.

Regulations followed by inspectors in many states specify that no open flame or fume-giving source of heat is to be used in a milk-handling area. There is no fuel combustion involved in heating electrically; therefore there is no soot, smoke or fumes to contaminate the milk. Usual practice is to use a heater controlled by a thermostat, adjustable to permit its being set forward to provide extra warmth when needed.

Most economical results are obtained, of course, in an insulated milk house. Best insulation from a standpoint of initial cost and returns in energy savings for the two most commonly encountered constructions is as follows:

Wood frame:

Ceilings: 4 in. loose mineral wool or equivalent.

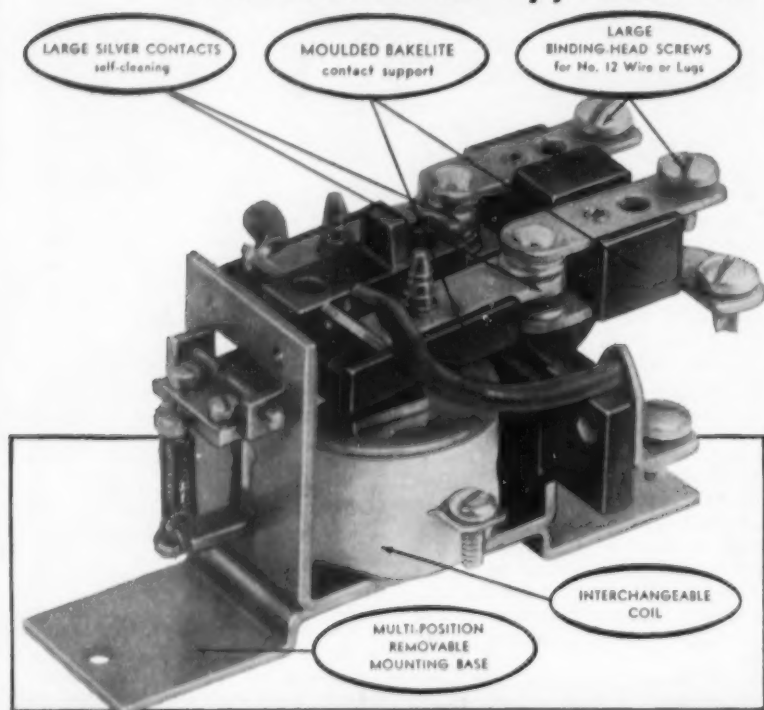
Walls: 2- or 3-in. mineral wool

NEW

GENERAL PURPOSE RELAY

(SERIES 130 RELAY)

...the most useful relay
for industrial application



**NO OTHER RELAY
IS SO VERSATILE**

SPECIFICATIONS

CONTACTS	RATINGS	COILS	MOUNTING BASE
Single-and-double pole	20 amp. at 115 V	AC & DC to 230 V	Metal strap or bakelite.
Single-and-double throw	60 Cy. AC or 24 VDC	(Interchangeable)	Base can be rotated 90
Aux. DT contacts available	U.L. Approved	Power—2 watts	degrees either direction
			for mounting convenience.

DIMENSIONS Base—1" x 3 3/8"

Request complete data on Series 130 Relay.

Wheelock SIGNALS
INC.
RELAYS  LONG BRANCH, N. J.



MILK HOUSE of dairy farmer in Mendon, N. Y. uses portable aluminum grid electric heaters. Installations such as this can cut energy costs in half by applying insulation to the concrete block walls.

batts or equivalent, depending upon whether framing is by 2x3's or 2x4's.

Concrete block:

Ceiling: 4-in. loose mineral wool or equivalent.

Walls: 1 1/2- or 1 1/2-in. furring strips with 1-in. mineral wool batts or equivalent, held in place by 1/2- or 3/4-in. gypsum board or equivalent. Outside of wall should be sealed.

In both of the above cases, all doors and windows should be weather-stripped and caulked.

In an area having an outdoor design temperature of 0 degrees F, a fully insulated milk house as described above can be kept at 40F using an installed capacity of about 1 watt per cu ft. If the ceiling alone is insulated, the requirement is about double, or 2 watts per cu ft. With no insulation at all, 2 1/2 watts per cu ft will serve.

For example, assume a 10x10x7-ft milk house in which heating will be required for approximately 1000 hours during a typical season, and that the cost of electricity averages 2 cents per kwhr.

Heater capacity = volume x watts/cu ft

Cost = heater capacity x cost/kwhr x hours

Thus with both ceiling and wall insulation,

Capacity = 700 x 1 = 700 watts

Cost = 700 x .02 x 1000 = \$14.

With ceiling insulation only,

Capacity = 700 x 2 = 1400 watts

Cost = 1400 x .02 x 1000 = \$28.

With no insulation,

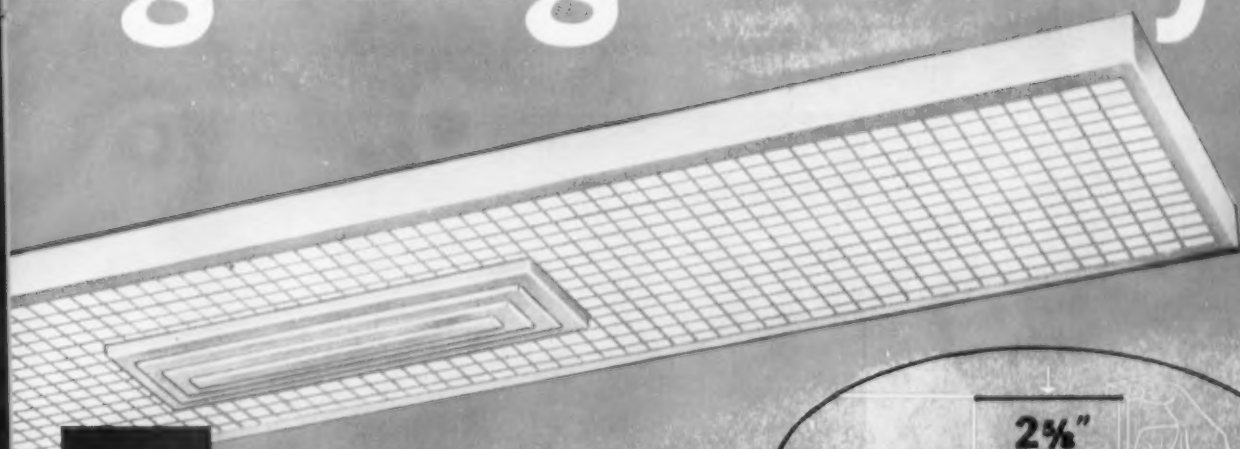
Capacity = 700 x 2.5 = 1750 watts

Cost = 1750 x .02 x 1000 = \$35.

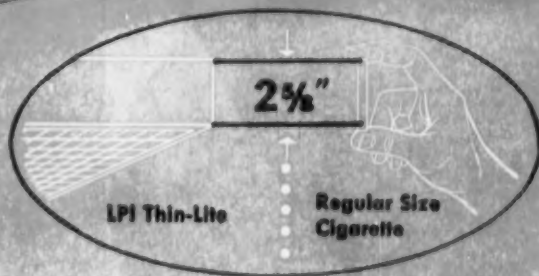
These simple calculations provide a reasonably accurate method for determining required milk house heater capacity and operating costs.

It's making

lighting history!



Thin-Lite



World's Thinnest Shielded Luminaire

No wonder Thin-Lite is creating such a sensation from coast to coast. Here, at last, is a surface mounted fixture so shallow that its depth below ceiling is essentially the same as that of troffers fitted with dished shields. Thin-Lite actually creates a semi-recessed effect.

The four different models (right) can be mounted end to end or side by side, in any combination, to form an unlimited variety of lighting patterns up to any desired size. A few suggestions are shown below.

Thin-Lite luminaires feature metal-framed, molded plastic louver panels, secured by LPI's patented floating hinge which cannot be seen from any angle, and which eliminates unsightly latches and fastening devices.

Available through leading electrical wholesalers, Thin-Lite luminaires are wired with standard E.T.L. ballasts.



THR 240—49" long, 12 1/4" wide, 2 1/4" thin. Two 48" Rapid Start lamps.



THS 296—97" long, 12 1/4" wide, 2 1/4" thin. Two 96" 430 MA. lamps.



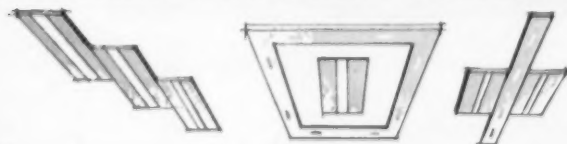
THR 440—49" long, 26 3/4" wide, 2 1/4" thin. Four 48" Rapid Start lamps.



THS 496—97" long, 26 3/4" wide, 2 1/4" thin. Four 96" 430 MA. lamps.

Mail Coupon for Detailed Information

LIGHTING PATTERNS UNLIMITED



LIGHTING PRODUCTS INC. Dept. 4C Highland Park, Illinois

Please send me a copy of Thin-Lite Brochure No. 530.

Name _____ Position _____

Company _____

Address _____

City _____ Zone _____ State _____

help yourself to

THE HANDIEST PLIER EVER DESIGNED

Interlocking
channels
a Channellock
exclusive

Reinforced ten-
sion edge . . .
another Chan-
nellock exclu-
sive

CHAN NEL LOCK

No. 420

Skilled mechanics every-
where tell us that the Chan-
nellock No. 420 is the hand-
iest plier of them all . . . the
plier they reach for more
often than any other. They
like its all 'round usefulness
. . . its pipewrench grip . . .
its streamlined design for
hard-to-get-at jobs. You'll
like Channellock, too . . . for
the same reasons. But . . .
when you ask for a Channel-
lock, be sure you get a
genuine Channellock. Only
Channellock has undercut,
interlocking channels that
can't jump out no matter how
hard you grip. So look for
the trade mark on the handle.

CHANNELLOCK
first choice of skilled Mechanics



CHAMPION DEARMENT TOOL COMPANY
HEADQUARTERS, PITTSBURGH, PENNSYLVANIA

Ramp Garage Calls For Precision Conduit Work

WIRING

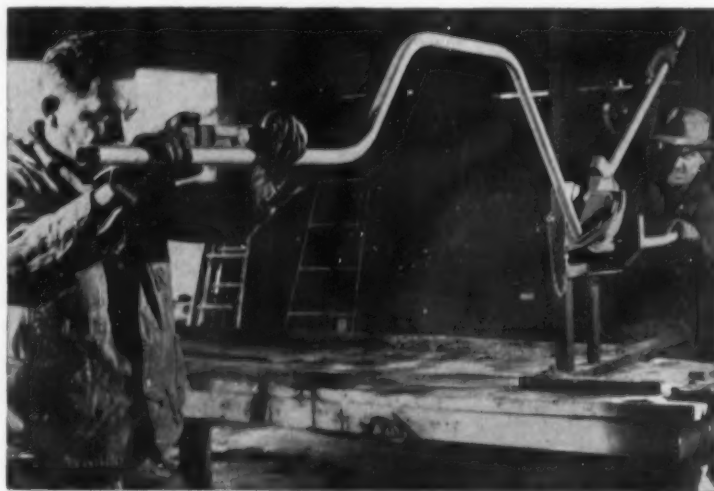
A new 6-level 528-car reinforced-concrete garage, recently completed on the Boulevard of the Allies in Pittsburgh for that city's Public Parking Authority, has a compact street-level control center for the relatively extensive distribution system in the structure. Installed by Fischbach and Moore, the center consists of a series of specially constructed panels, with corner-welded

framing channels and heavy galvanized steel rear sections. Panels are bolted between vertical supporting angles which were in turn secured to building steel prior to the installation of walls and partitions.

Conduit bending and placement was a precision job, for all floor slabs slope in one direction or another to create series of continuous



DEEP GIRDERS, sloping floor slabs and surface-mounted boxes necessitated frequent conduit bends, use of beam clamps and stud guns for driving threaded inserts into concrete.



CAREFUL MEASUREMENTS, use of jigs and templates, and accurate checking with levels and plumb lines resulted in a precision bending and installation job in this Pittsburgh ramp garage.

Cordomatic DROP LIGHT REELS

A NEW CONCEPT IN LOW COST PORTABLE LIGHTING



**...Saves Time...Cuts
Costs...Greater
Safety On Every Job**

A "standard" in garages and service stations everywhere, the Cordomatic Drop Light Reel is ideal for warehouses, loading docks, construction jobs and dozens of other uses! Mounts easily on wall or ceiling, automatically reels in and out to any desired length, locks and releases like a window-shade. High in quality, low in cost... lights up and speeds up any job!

Crack-proof, easy grip handle with Leveller Toggle-action switch... swing open chrome lamp guard... oil and water resistant Neoprene cord.

Available in 20', 30' and 40' cord lengths.

A complete line of Cordomatic Reel Products is available from your local distributor.

Send for free illustrated brochures and price sheets.

CORDOMATIC
Dept. "T", 17th & Indiana Ave., Philadelphia 32, Pa.
Please send free catalog and dealer cost sheet

Name.....
Firm.....
Address.....
City.....Zone.....State.....
Your Jobber.....



80 Pounds of Heavy-Duty Power For Easier Threading On The Job!

ONE MAN CAN CARRY IT

WRENCHLESS CHUCK GRIPS TIGHT FOR BOTH RIGHT AND LEFT HAND OPERATION

RUGGED ALUMINUM CASE

USE IT TO THREAD, REAM, CUT OFF, OR TURN UP FITTINGS

NOTE THE HANDY TOOL RACK ON THIS CHIP PAN

STURDY, STEEL STAND FOLDS FOR EASY CARRYING

YOUR CHOICE OF ELECTRIC, GASOLINE OR AIR MOTOR

STANDARD RANGE: 1/8" TO 2" PIPE
EXTRA RANGE: UP TO 12" PIPE

OSTER

NO. 142
Featherweight
CHAMP

Power Drive For Hand Pipe Tools

Now, thread 1" pipe up to six times faster than by hand . . . in the shop, in the truck or on the job . . . with your present hand tools and this powerful Oster No. 142 Featherweight Champ.

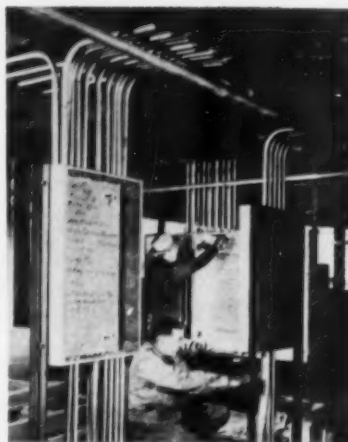
See this and other dependable Oster pipe machines at your nearby Oster Selective Distributor. Ask about the special time-payment purchase plan whereby you can buy any Oster machine for only 25% down.

For descriptive literature, write to:

OSTER
Builders of
the World's Most
Complete Line of
Threading
Equipment

For other Models
write for General Catalog

THE OSTER MANUFACTURING CO., 1313 East 289th St., Wickliffe (Cleveland), Ohio



CONTROL PANELS, specially constructed to enclose specific switchgear, are supported by flanking vertical angles which are in turn secured at the bottom to building steel.

ramps, and deep floor beams had to be underpassed at each column line. This necessitated frequent changes in direction, the extensive use of power-driven inserts to hold conduits snug against slab undersizes, and the attachment of flange clamps beneath beams. As indicated in the accompanying illustrations, the multiple banks of conduits were neatly racked, accurately offset or turned at panel positions, properly bushed and braced. Spang conduit was used for this installation, and accuracy of bends was obtained through the consistent use of jigs, templates, levels and plumbs during both the pre-fabrication and actual installation periods.

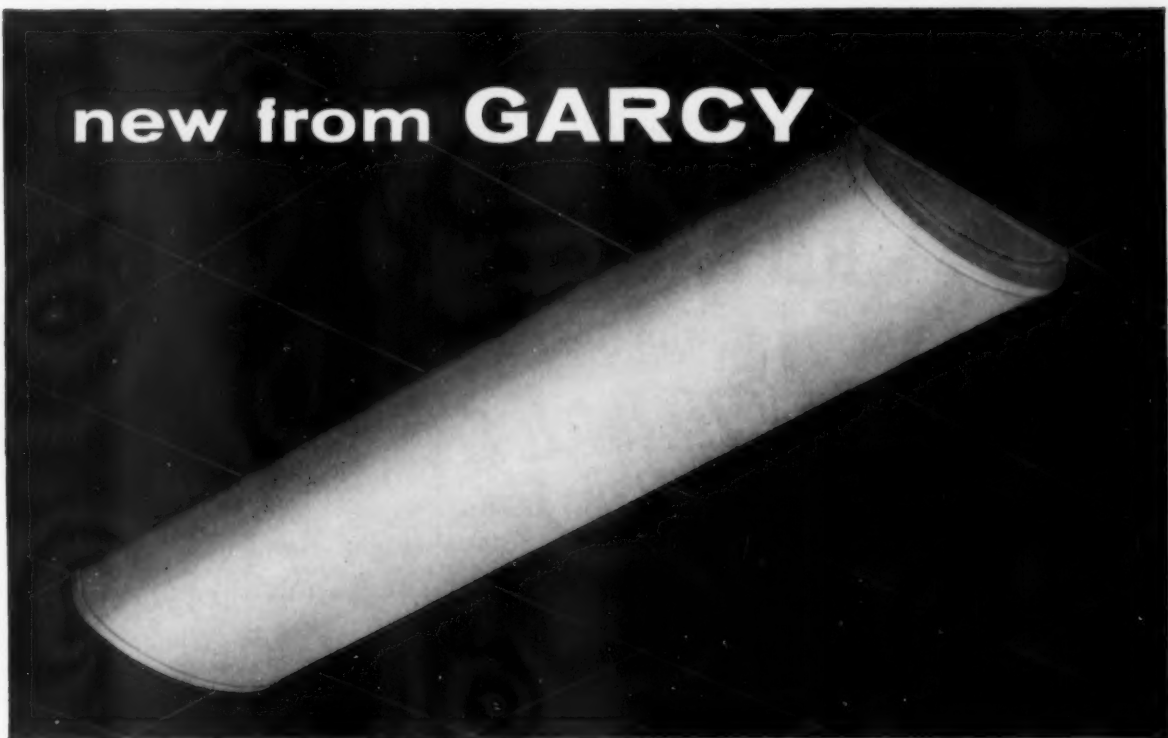
Protective Hoods Cut Bushing Damage

METHOD

The best way to eliminate equipment damage during installation is to take measures to prevent such accidents. That is the philosophy of Graul Electric Service, electrical contractors of Mascoutah, Ill. It was applied with considerable success to construction of a 34-kv substation to serve the electrical needs of Peabody Coal Company's new processing plant near Freeburg, Ill.

Typical of Graul's "damage prevention" technique is the use of wooden hoods which are placed over transformer and other equipment bushings while mechanics are working "topside" on the substation structure. Dropped tools and accessories merely bounce off

new from **GARCY**



As ceiling heights go down **Ultra-Lux goes up**

The trend to lower ceiling heights in schools and office buildings calls for a new shallow lighting fixture. Low ceilings rule out conventional pendant mounted units. Shallow ceiling construction does not permit recessed fixtures.

Surface-mounted Ultra-Lux, with its shallow profile, provides an attractive and efficient answer . . . gives a recessed appearance at surface-mounted cost. Its gently curved shield of polystyrene seems to recede into the ceiling.

With its translucent polystyrene shield, Ultra-Lux provides efficient light transmission and uniform distribution. The uniform surface brightness of Ultra-Lux is well within acceptable limits for glare-free comfort.

Light in weight, light in appearance, sturdily built, and easy to install, Ultra-Lux fixtures may be installed in single units or joined in continuous runs. Concealed hinges simplify cleaning and relamping.

GARCY

Preferred for Performance



COMPLETE
COMMERCIAL
LIGHTING

Recessed Appearance
Surface-Mounted Cost



GARCY Ultra-Lux
Total Depth 3 1/4"

Garden City Plating and Manufacturing Company
1730 North Ashland Avenue • Chicago 22, Illinois
In Canada: Garco of Canada, Ltd., 1244 Dufferin Street, Toronto 4



for greater plant
safety and security

REPLACE NOW WITH **SUPER** *Twist-Lock*

featuring Screwless
Pressure-Grip Termin-
als and Dead Front



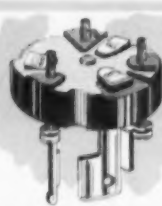
**2 PC.
DEAD FRONT CAP**
For Greater Safety

Dead front completely encloses cap, keeps out foreign particles that might short-circuit contacts. No need for fibre insulating disc, therefore no extra parts to lose or forget to use.



**TERMINALS ARE
LOCKED IN**

Terminals are pressure gripped in place, can't pull out. Conductors are confined in their individual pockets, can't spread. No danger of flash over. Design assures greater wiring uniformity.



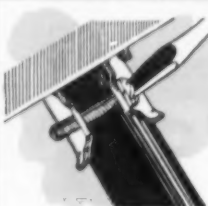
GREATER BLADE RIGIDITY
For Greater Strength

Stronger, rigidly supported contacts withstand hard knocks, retain uniform alignment and maintain polarity.



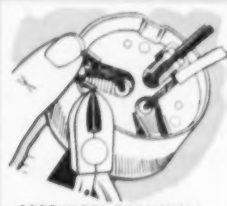
**HEAVIER ARMOUR
BUT MORE COMPACT**
For Longer Life,
Safer Performance

Rugged protective steel shell protects inner construction, resists the roughest industrial usage.



**IMPROVED CORD GRIPS
RELIEVE STRAIN
FROM CONTACTS**

Powerful cord grip design provides pull-proof pressure grip on cable.



**SCREWLESS TERMINALS
SPEED WIRING...
CUT COSTS**

No awkward binding posts. 2-pc cap and connector body can be wired in 1/10 the time, thus reducing installation costs.

Interchangeable with Regular Twist-Lock
units of equal rating.

Folder tells the complete
story. Write today.

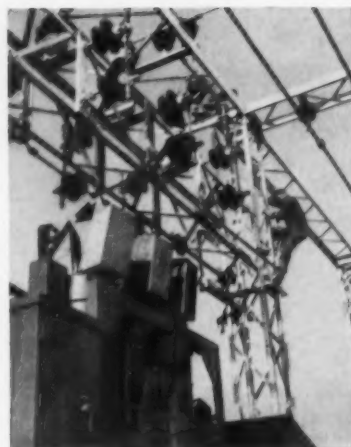
HARVEY HUBBELL, INC.

HIGHEST QUALITY
WIRING DEVICES • MACHINE SCREWS

DEPT. C-1 BRIDGEPORT 2, CONNECTICUT

**WIRING DEVICE
WAREHOUSE LOCATIONS
ASSURE NATIONWIDE
STOCK AVAILABILITY**

Bridgport 2, Connecticut
State and Bostwick Streets
Chicago 7, Illinois
37 South Sangamon Street
Los Angeles 12, California
103 North Santa Fe Avenue
San Francisco, California
1675 Hudson Avenue
Dallas 7, Texas
1111 Dragon Street



PROTECTIVE HOODS over bushings (ar-
row) prevent falling tools and accessories
from chipping and cracking porcelain.
Weatherproof plywood boxes are part of
"damage prevention" technique devel-
oped by Graul Electric Service personnel.

the wooden shields. There is no
danger of chipping or cracking the
porcelain insulators.

The hoods are actually a series
of five-sided, rectangular, sturdy
plywood boxes made of different
depths and sizes to fit specific
equipment items. Each box is var-
nished and weatherproofed to with-
stand the elements. Usually, the
hoods are kept in place until the
job is finished to give added pro-
tection against moisture seepage,
etc.

Graul mechanics like the idea of
the protective hoods. In addition
to their damage prevention fea-
ture, the hoods effectively eliminate
a "mental hazard" which normally
exists when men know there are
exposed fragile equipment items
below their work stations.

Electric Heaters Provide Two Temperature Levels

HEATING

Evidence of the rapidly increas-
ing use and diverse applications of
electric heat is seen in the installa-
tion at the Union Exchange of the
Consolidated Telephone Company,
Union, Ky. This is an unattended
dial exchange located in a 12- by
18-ft building insulated with 1½-in.
glass fiber blankets.

The problem was to maintain a
minimum temperature of about 45
degrees to insure proper operation
of equipment, and to provide more
heat on the few occasions when

Now!

ADVANCE FLUORESCENT LAMP BALLASTS INDIVIDUALLY PACKAGED

For further details on how you can increase your ballast sales with ADVANCE Fluorescent Lamp Ballasts in modern individual cartons, contact your ADVANCE salesman, or write, phone or wire today.

Yes, now ADVANCE Quality Fluorescent Lamp Ballasts packaged in modern individual cartons are available from your authorized ADVANCE Distributor. These individually packaged ADVANCE Fluorescent Lamp Ballasts put an end to loose dangling lead wires, prevent damage to lead wire and assure you of factory fresh ballast stock always. End labels on the new individual cartons permit instant identification of ballast type, catalog number and pertinent electrical characteristics.

Your authorized distributor carries a complete stock of all popular ADVANCE ballasts to give immediate replacement service for any make fluorescent lamp ballast whenever replacement is necessary. Simply bring the inoperative ballast to any ADVANCE Service-Stocking Distributor. The ADVANCE cross-reference guide shows at a glance the replacement needed, and in a few moments, you can be back on the job with the correct ballast.

To give better customer service, save time and effort . . . insist on quality ADVANCE Fluorescent Lamp Ballasts in the new modern individual cartons.

ALL HPF BALLASTS CARRYING THE ADVANCE LABEL ARE DESIGNED TO CONFORM TO CBM SPECIFICATIONS

The Heart of the Lighting Industry



ADVANCE



World's Largest Exclusive
Manufacturer of
Fluorescent Lamp Ballasts



TRANSFORMER CO.
2950 NO. WESTERN AVE. CHICAGO 18, ILL. U.S.A.

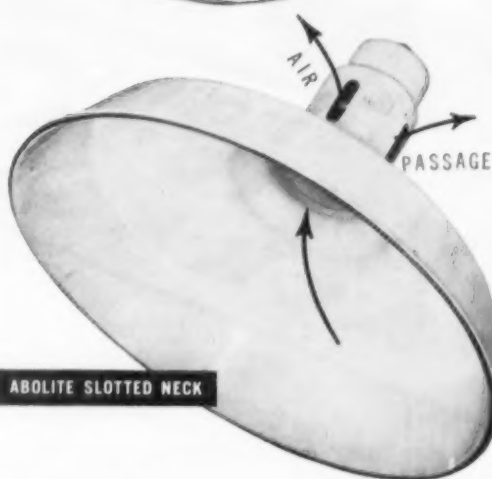
Keeping industry bright with **ABolite**



STANDARD FIXTURE

6-MONTH TEST RESULTS

The photographs show two reflectors after 6 months of side-by-side use in the core department of the James B. Clow and Sons plant, Coshocton, Ohio. Note the heavy deposit of dirt and grime on the non-vented unit, drastically reducing its illuminating value. The Abolite slotted-neck reflector shows minimum dirt deposit, lighting efficiency remains high.



ABOLITE SLOTTED NECK

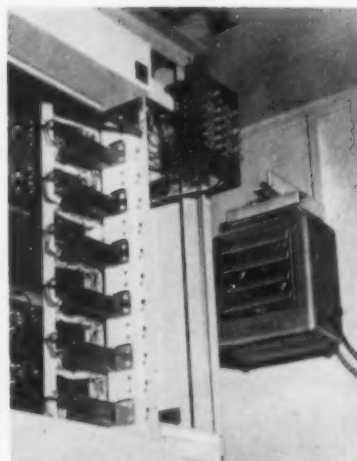
Self-cleaning Abolite fixture gives 30% more light, longer lamp life

The slotted-neck reflector design, by Abolite, greatly increases lighting efficiency and lamp life, cuts maintenance costs way down. Air circulation through the ventilator slots keeps dust and grime on the move. Lamp and reflector stay clean nearly twice as long, give 30% more illumination. Lamp operating temperature is reduced 40%. Make sure you get all these advantages—at no extra cost—by specifying Abolite. For full details on Abolite's complete line of lighting fixtures, write *ABolite Lighting Division, The Jones Metal Products Co., West Lafayette, Ohio.*

ABOLITE



LIGHTING



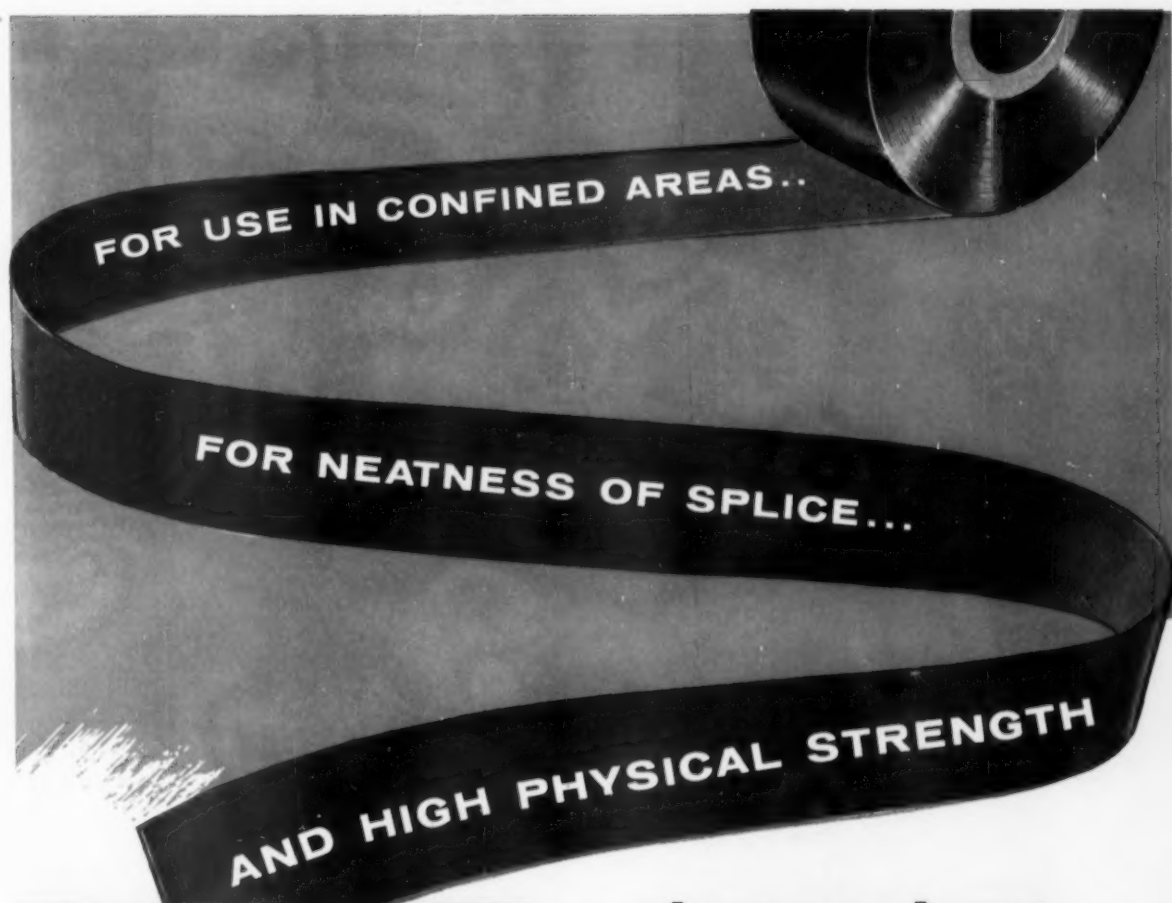
PORTABLE HEATER suspended from wall near dial telephone exchange equipment maintains minimum temperature level to insure proper functioning of communications components.

employees are required to work in the exchange. The solution was the installation of two 1500-watt aluminum-grid combination portable and suspension-type heaters with built-in thermostat.

With the thermostat on one heater set slightly above the other, it has been found that except in extremely cold weather, one heater carries the load. When extensive work in the building requires more heat, the thermostat setting of the second heater is simply raised. To provide equal use of the two heaters, the thermostat settings are reversed at regular intervals. In service now for three winters, the installation is yet to require its first maintenance.



MILES INSTEAD OF STEPS is the daily log of Bill Puscheck, job superintendent of Berry Electric Company, Chicago. Here, he starts out from field shop at Cermak Shopping Center in Berwyn to make rounds of numerous stores in his trusty motor scooter. With plans in lap and wiring accessories in "trunk", he cuts hours from the daily time necessary to keep his crew on the project supplied with installation information.



depend on U. S. Royalastic PLASTIC TAPE

For making a thin splice and keeping wiring neat and uncluttered, makers of electrical original equipment find Royalastic is best. Complete mechanical and electrical protection. High tensile strength and excellent resistance to abrasion, water, oils, acids, alkalis and corrosive chemicals. Good stretch, pulls down tight, stays on. Eliminates need for using rub-

ber AND friction tapes: Royalastic does the work of both. Approved by Underwriters' Laboratories, Inc.

U. S. Royalastic is always in instant supply. Put in your order today. Get in touch with any of United States Rubber Company's numerous distributors, any of the 28 "U. S." District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y.



Mechanical Goods Division

United States Rubber

ANNOUNCING WESTINGHOUSE *with* **ULTR**

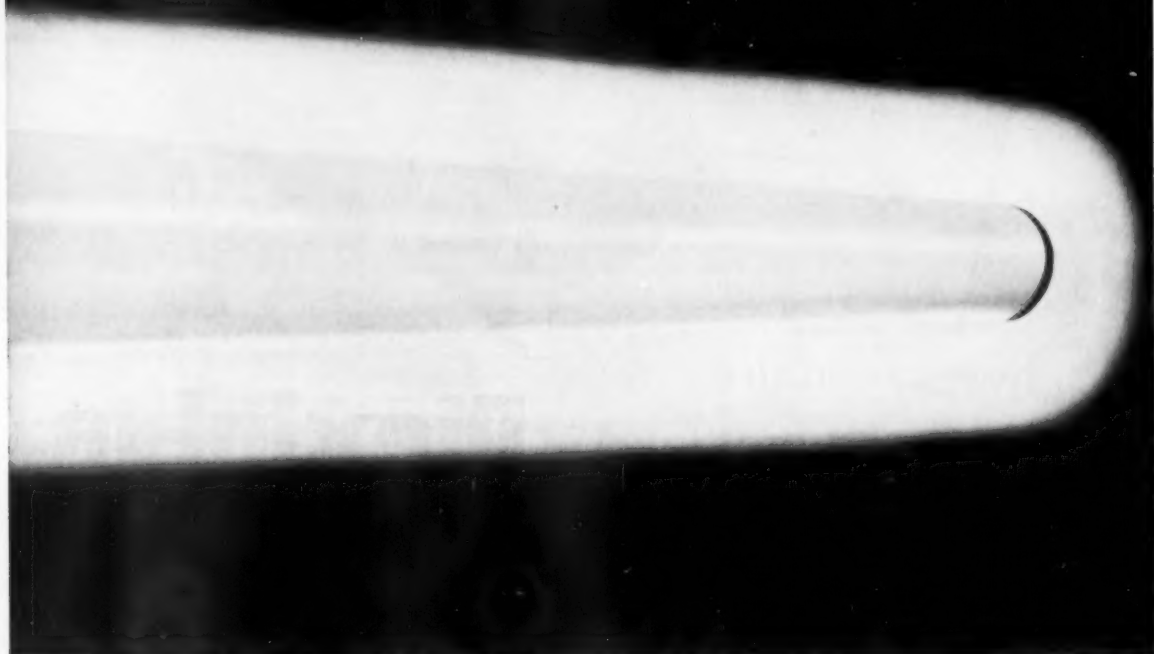


YOU CAN BE SURE...IF IT'S **Westinghouse**

FLUORESCENT LAMPS

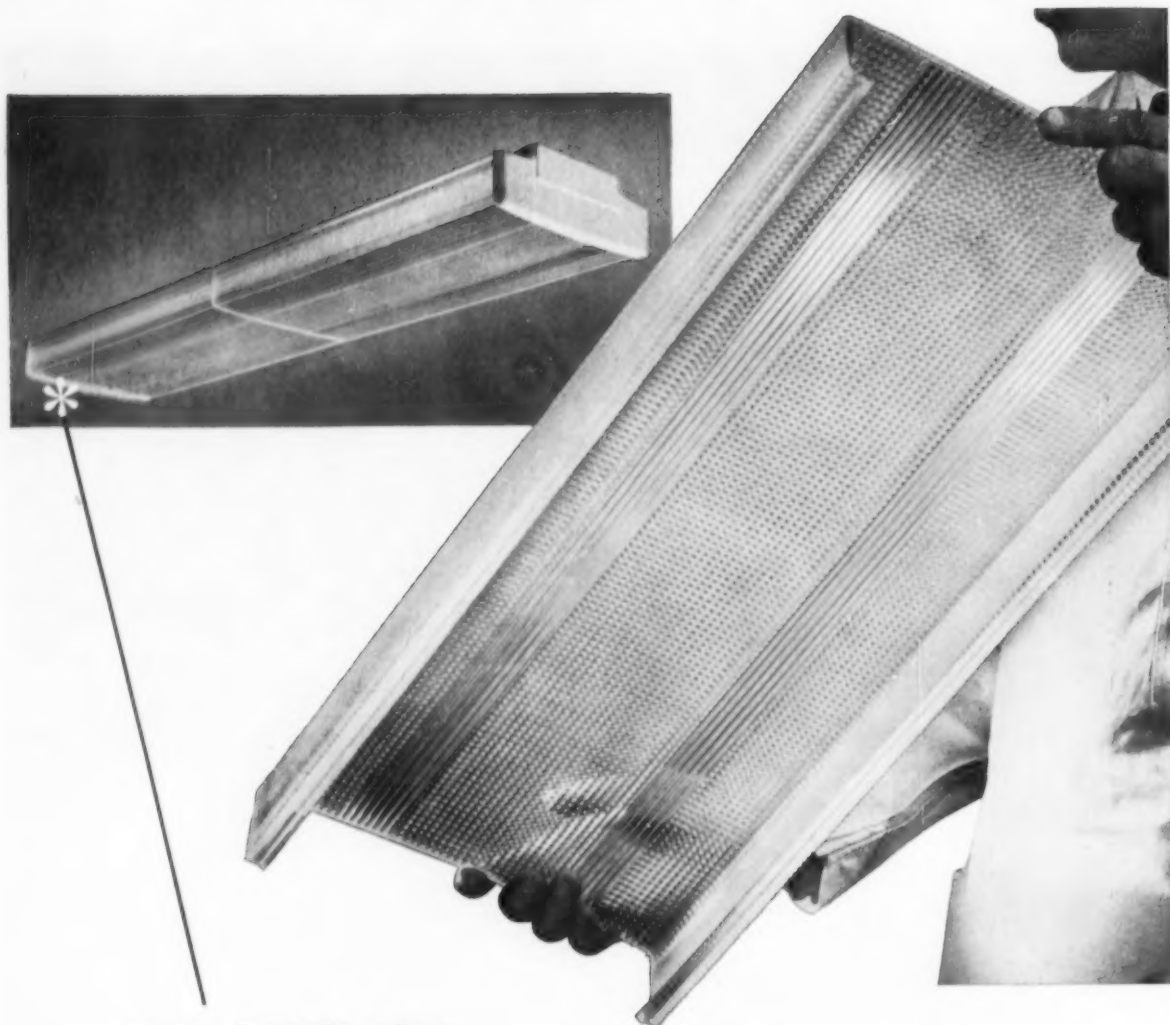
ALUME[®]

high intensity phosphors



START BRIGHTER . . . MAINTAIN BRIGHTNESS LONGER . . .

- **MORE LUMENS PER WATT**—more light for your dollar.
- **PLUS UNIFORM END-TO-END LIGHT** . . . always perfectly color-matched . . . maximum light output maintained throughout life—and carrying the **WESTINGHOUSE ASSURANCE** of performance satisfaction or full purchase price refund.
- Get the most for your lighting dollar—call your Westinghouse Lamp Distributor today, or write Westinghouse Lamp Division, Dept. EC, Bloomfield, N. J.



new luminaire . . .

with light-control lens of Plexiglas

Molded of PLEXIGLAS® acrylic plastic, the prismatic enclosure of this recently introduced fluorescent luminaire contributes many basic design advantages:

Light Weight and Strength make possible a simplified design notable for the absence of heavy metal framing . . . resulting in slim, compact, architecturally harmonious appearance. The entire lens section is hinged, can be swung down for easy relamping and cleaning.

Shatter Resistance makes the luminaire especially suitable for locations where safety is a prime requisite.

Precise Moldability to the lens pattern results in an efficient optical element that provides a high level of downward light and, at the same time, complete visual comfort.

Dimensional Stability and Freedom from Discoloration insure long term efficiency, beauty and economy.

Write today for the names of manufacturers of fluorescent luminaires featuring molded PLEXIGLAS enclosures.



Chemicals for Industry

**ROHM & HAAS
COMPANY**

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

*Canadian Distributor: Crystal Glass & Plastics, Ltd.,
130 Queen's Quay at Jarvis Street, Toronto, Canada.*

Motor Shops

Agitator Washer Cleans Motor Parts

Baskets loaded with motor component parts (one basket per motor) get a good dunking in hot caustic solution at General Electric Company's service shop in Chicago. But that's not all. Paint and dirt particles loosened by the caustic are dislodged and washed from the parts by the up and down swishing action of the agitator washer. When the parts are clean, the trays go along a conveyor line to the assembly area where they await rewound stators and rotors.

The washing tank is located at a pivotal point between dismantling, stripping and final assembly areas in the new conveyORIZED, semi-automated repair line set up to cut overall repair time for alternating current motors by some 50%. Units up through 50 hp in size are repaired on the new line.

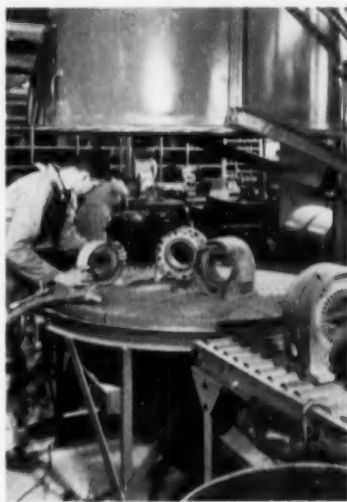
Parts baskets rest on a reciprocating (vertical) platform in the tank. This is actually a section of roller conveyor which, in the "load" and "unload" positions, is at the same height as the line conveyors. Baskets loaded with dirty parts are merely rolled onto the tank platform which is then lowered into the

hot caustic solution by means of hydraulic control. The operator then closes the tank cover and sets the controls for agitation. At this point, cleaning is automatic and no attendant is needed. After a predetermined time, the operator returns to stop agitation; raise the platform; unload and reload the tank; and repeat the cycle.

According to shop personnel, the agitator washer saves about 75% of the time normally required by steam cleaning or spray cleaning of motor parts.

Rotating Table for Sand Blast Unit

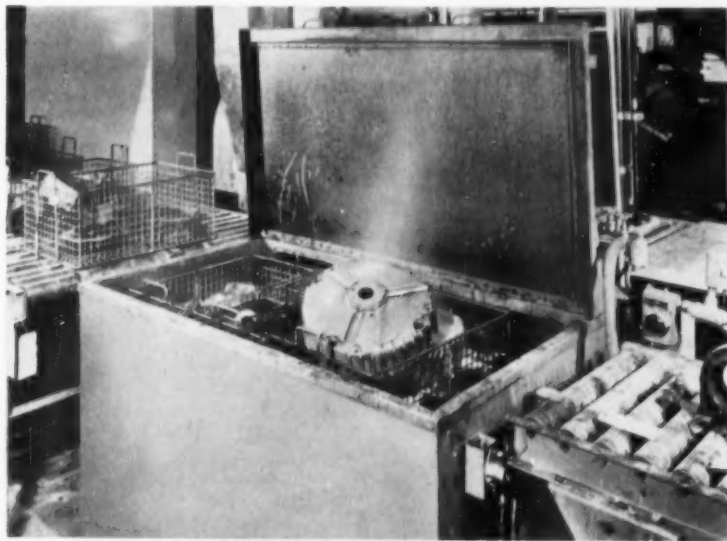
A circular sand blasting table with counterweighted protective hood is one of the innovations added to the semi-automated motor repair production line at General Electric's Service Shop in Chicago. The unit is located in a roller conveyor line connecting the roasting and stripping section with the stator winding tables. All stripped stators are subject to sand blast cleaning before passing to the winding department.



ROTATING TABLE in sand blast unit features in-line loading and unloading from adjacent conveyors. Counterweighted hood is lowered for cleaning operations. Perforated table can be rotated by hand wheel as operator plays high-pressure sand stream on stators. Sand comes from hopper under table.

The table itself is at conveyor height, is 6 ft in diameter and composed of six pie-shaped segments of perforated steel rotating around a center point. The operator rotates the table clockwise or counterclockwise, as desired, by simply turning a hand wheel on the front of the supporting framework. Several stators can be placed on the perforated table, the actual number depending upon size and sufficient spacing between units to give the operator a chance to direct the sand blast stream at all parts of the stator being cleaned. The conveyORIZED repair line handles motors up to 50 hp in size.

Directly under the rotating table is a large cone-shaped metal hopper which contains the fine sand used in the cleaning operation. A flexible hose carries the sand from the bottom of the hopper to the spray nozzle, where it is directed under compressed air in a high-pressure stream on the surface of the stator. After blasting the stators, the sand drops through the table perforations back into the hopper. On its return trip the sand passes through a fine screen which catches dislodged particles of paint and dirt. The screened sand is then ready for reuse.



AGITATOR WASHER cuts parts cleaning time in the motor repair department of General Electric's Chicago service shop. Vertically reciprocating platform swishes parts baskets in hot caustic solution to dislodge loosened paint and dirt particles. Unit contributes to overall reduction of repair time on new semi-automated production line.



SWITCH BOXES

OUTLET BOXES

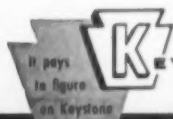
For faster, easier box installations, specify the
KEYSTONE QUALITY LINE



BAR HANGERS AND
 BAR-BOX COMBINATIONS

You name it and Keystone has it! Square cornered, bevel cornered, and non-gangable switch boxes. Octagon, square, and handy type outlet boxes. Plus bar hangers and bar-box combinations to meet every need. What's more, every item in the Keystone Quality Line is loaded with time-saving, cost reducing features. Knockouts and pri-outs are designed for easy, split-second removal. BX or Romex clamps are preassembled and nested in the box for easier pulling of wires. Holes for clamp screws are extruded to eliminate stripping of threads. Switch and outlet boxes are available with brackets for side or face mounting to studs. And the popular octagon outlet boxes are offered separately or in combination with deep or shallow offset bar hangers.

Yes, when it comes to wiring devices and wiring installation equipment, you can count on Keystone for the items you need when you need them. A complete new catalog describes the entire Keystone Quality Line. Send for your free copy today!



KEYSTONE MANUFACTURING COMPANY

23328 SHERWOOD AVENUE • CENTER LINE (Detroit) MICHIGAN

... the Complete Line of Wiring Installation Equipment
SOLD ONLY THROUGH RECOGNIZED ELECTRICAL DISTRIBUTORS

Actual cleaning of the stators is done under a circular hood which rests snugly around the rotating table. A lip and gasket arrangement between hood and table frame retains the fine sand within the table. Four pivoted, channel-iron arms position the hood over the table. Counterweights on the two lower arms permit the operator to raise and lower the hood with little effort.

After the table has been loaded with stators, the operator lowers the hood, places gloved hands with the spray nozzle through a slot rubber curtain shield and turns on the sand spray. A hooded, tilted, glass window at shoulder height plus a built-in down-light in the top of the hood gives the operator a clear view of the cleaning operation.

As soon as the stators have been cleaned to the operator's satisfaction, he raises the hood. The cleaned stators are then transferred to the adjacent roller conveyor and passed on to the winding department. The table is reloaded with stators waiting on the conveyor at the right and the operation repeated.

Application of the sand blasting technique with the equipment described effected a substantial reduction in stator cleaning time at the G. E. shop. Not only do the units go through this operation much more quickly, but they come out much cleaner than with hand cleaning methods.

In-Line Spray Hood Has Dual-Draft Exhaust

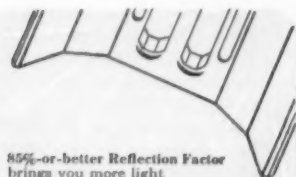
Several in-line work stations are a feature of the new semi-automated production line recently installed at General Electric Company's Apparatus Service Shop in Chicago. In general, alternating current motors up through 50-hp size pass through the repair line on a series of integrated roller conveyors. Wherever possible, work stations are an integral part of the conveyor line. The resultant reduction in equipment handling contributes substantially to an overall slash of some 50% from the former time required to repair a defective motor.

One of the work areas near the end of the line is the paint spray station located between the assembly table and test panel. Here, an operator sprays the assembled motor as it comes along the con-



**MORE
UPWARD
LIGHT**
for
better
results

More Upward Light reduces brightness contrast, increases seeing comfort, minimizes eye fatigue.



85%-or-better Reflection Factor brings you more light for your money.



All White Porcelain Enamel Reflectors support better visibility conditions, as well as encourage better housekeeping.

All these things considered...

1. Specific Units for Every Need
 2. Precision Construction
 3. Low Installation Cost
 4. Minimum Maintenance Cost
 5. Lowest Over-All Cost
- make BENJAMIN the choice for better lighting!



10-10511R

Get the Facts about this Newest Advance in Factory Lighting

Better factory lighting today calls for more upward light as provided by the new Benjamin RLM Diffuser Reflector. By minimizing contrast between ceiling and the reflector, this unit improves visual comfort. Thus it contributes to lower cost, higher quality industrial production.

With the new Benjamin Diffuser Reflector you get this needed upward light at lowest over-all cost. You get a unit that meets the new, higher RLM standards for this type of upward light reflector. In addition, you get many exclusive Benjamin features, such as Springlox lampholders, Life-Time porcelain enamel, special hanger and coupling devices for individual or continuous line installation... all of which reduce the over-all lighting cost.

The new Benjamin pamphlet on "Better Factory Lighting" brings you helpful suggestions on lighting selection. Read it with profit for a further insight on why, when all things are considered, the Better Lighting Choice is Benjamin. For your free copy, write Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Ill.

BENJAMIN TRADE MARK DIFFUSERS

SOLD EXCLUSIVELY THROUGH ELECTRICAL DISTRIBUTORS

UNSEEN
QUALITY
 THAT WORKS FOR YOU
 IN EVERY
 INSTALLATION



QUAD Aisle-Stock REFLECTORS

for every

- SHELVING
- BIN or
- SIMILAR
 LIGHTING
 REQUIREMENT

Except for excellence of appearance you don't see the Quad reflector quality that is built-in—but it is there, in full measure.

For example, when you install Quad-Aisle-Stock Reflectors you give your customers units that daily demonstrate their quality through durability. These units are accurately formed of heavy gauge steel, porcelain enameled with ground coat and white inside and outside.

You give your customers units that provide a wide spread of light downward and outward to each side of aisle—that provide lighting for upper shelving and that have an eye shielding feature because of lower light cut-off angle at each end of reflector. Ask for catalog No. 10.

QUADRANGLE MFG. CO.

325. PEORIA ST.

CHICAGO 7, ILL.



DOWN-DRAFT spray hood with top and bottom exhaust vents carries paint fumes up vertical duct and away from operator at paint spray station between assembly table and test panel. In-line painting is part of semi-automated repair line recently installed at General Electric's service shop in Chicago.

veyor. The "booth" consists of a simple vertical metal hood attached to one side of the conveyor frame and opposite the mechanic's work position. A forced-draft exhaust system pulls the excess fumes away from the operator and work and carries them up a vertical duct. Hood vents at both top and bottom of the spray area provide dual suction to effectively remove the fumes.

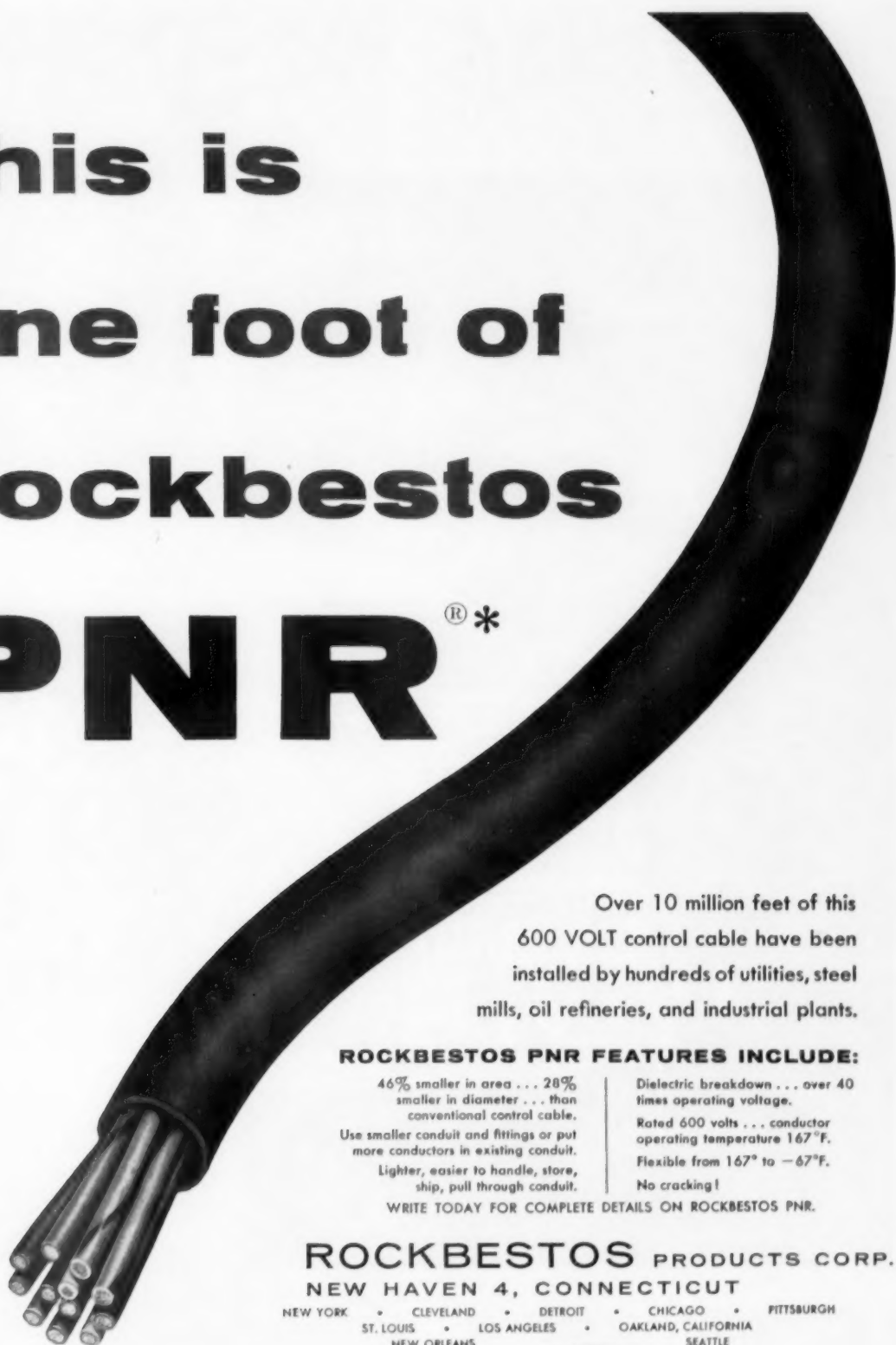
Excess paint from the spraying operation accumulates on the inside of the hood which has been coated with a grease-like compound that does not harden. Whenever the hood interior needs cleaning, the accumulated paint deposit can be easily scraped off. When the hood is clean, another coat of compound is applied to form an easy-to-remove base for next accumulation.

Corn Grits Blasting Cleans Motor Windings

Grits blasting using ground corn cobs in a compressed air stream is the latest technique used to clean motor windings in the motor repair department of the Koontz-Wagner Electric Company in South Bend, Ind. Although light in weight and of a soft consistency, the grits have sufficient physical mass to do an efficient cleaning job without damage to coil insulation. The grits also tend to absorb much of the oil, grease and dirt dislodged in the blasting operation.

The Pangborn cleaning unit con-

This is One foot of Rockbestos PNR[®]*



Over 10 million feet of this
600 VOLT control cable have been
installed by hundreds of utilities, steel
mills, oil refineries, and industrial plants.

ROCKBESTOS PNR FEATURES INCLUDE:

46% smaller in area . . . 28%
smaller in diameter . . . than
conventional control cable.
Use smaller conduit and fittings or put
more conductors in existing conduit.
Lighter, easier to handle, store,
ship, pull through conduit.

Dielectric breakdown . . . over 40
times operating voltage.

Rated 600 volts . . . conductor
operating temperature 167°F.

Flexible from 167° to -67°F.

No cracking!

WRITE TODAY FOR COMPLETE DETAILS ON ROCKBESTOS PNR.

ROCKBESTOS PRODUCTS CORP. NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH
ST. LOUIS • LOS ANGELES • OAKLAND, CALIFORNIA
NEW ORLEANS • SEATTLE



*P — polyethylene, N — nylon, R — Rockhide (PVC)

The Fastest Growing "T" Light!

only **COMPCO** offers you ...

New Thinner Design!

... to fit your
new construction
and modernization
program ...

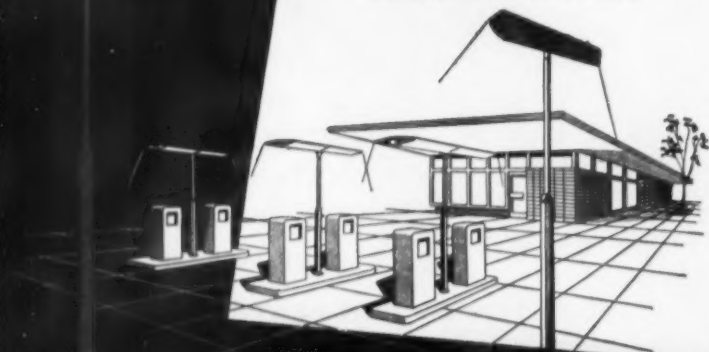


High Intensity
Fluorescent Fixtures

COMPLETE SERVICE STATION
LIGHTING EQUIPMENT

- All Weather Horizontal "T" Lights
- High Intensity R.S. Fluorescent Flood Lights
- Auxiliary Fluorescent and Incandescent Lights
for Outdoor and Indoor Application

New Thinner Design "T" Lights are engineered
for still greater strength, more graceful
smoother appearance and greater efficiency.



Single Pole
Fixture

COMPCO CORPORATION

2251 WEST ST. PAUL AVENUE • CHICAGO 47, ILLINOIS • U.S.A.

Manufacturers of Fine Lighting Equipment for Over 24 Years



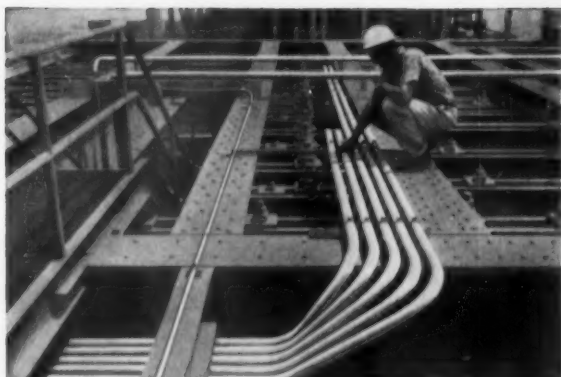
GRITS BLASTING of coils in a 40-hp, dc stator. Corn grits in air stream clean all grease, oil and dirt from windings without damage to insulation. Shop cleaning is done in front of spray booth with exhaust fan to help confine particles.



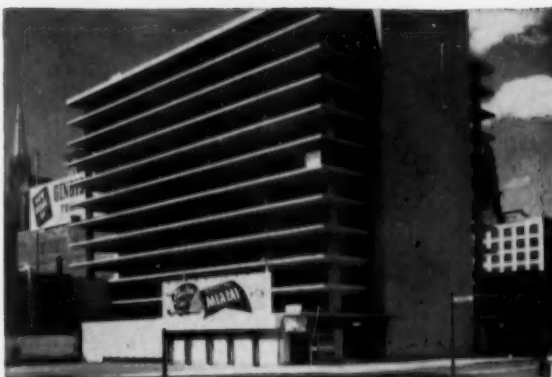
ADJUSTING VALVES on portable tank to control density and pressure of grit stream at hose nozzle. Grits can be shut off and compressed air stream used to blow out stator after cleaning.

sists of a hopper-type tank mounted on two large-diameter spoke wheels for mobility. A dual-valve arrangement permits manual control and adjustment of the grit stream pressure and density to fit the cleaning problem at hand. After the equipment has been cleaned, the grits can be shut off and the compressed air stream used to blow out any particles that may have been caught in the coils or frame.

Mobility of the equipment provides a distinct advantage. It can be used anywhere in the shop for small or large motors or can be



... at Valley Steam Plant, Los Angeles Department of Water & Power ...



... at Parking Facilities No. 1, Chicago Parking Authority ...



... at Greater Pittsburgh Airport Terminal Building Fountain ...



... at Shumpert Memorial Hospital, Shreveport, Louisiana ...



... at Marian High School, Framingham, Massachusetts ...



... at West Penn Power Company's Office Building, Cabin Hill, Pa. ...

...and all across the nation,
easy-to-work-with

SPANG® HD CONDUIT

HAS HELPED CONTRACTORS MAKE PROFITABLE,
TOP-QUALITY ELECTRICAL INSTALLATIONS!
*Why? Because SPANG HD Galvanized
Conduit offers these working advantages:*

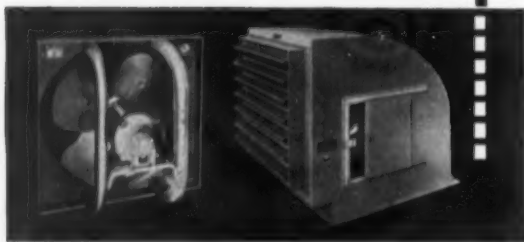
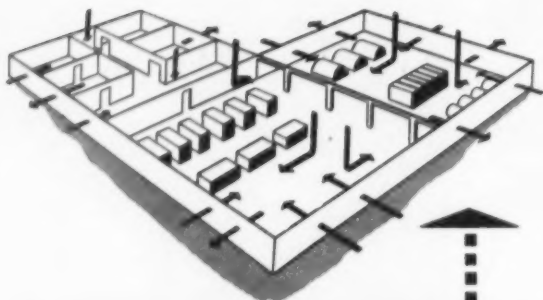
1. **Quality controlled manufacturing**—careful attention to heat, pressures and welding during processing produce a uniform product that is easy to cut, bend and thread.
2. **Top-quality finishing**—hot-dipped, heavy-duty galvanizing, evenly applied and coated with lacquer, prevents finish cracking, chipping, flaking or peeling off even under severe bending strains.
3. **Testing and inspection**—on each lot of SPANG HD to assure you of a top-quality product every time!

You can save time (and make a profit, too) with easy-to-work-with SPANG HD Conduit. Try it on your next job. Your nearby SPANG Distributor is at your service.



LET **Chelsea**
SHOW YOU HOW...

EFFECTIVE VENTILATION
Increases
WORKING EFFICIENCY



Wherever people work—peak performance is in direct ratio to good ventilation. Industrial hygiene statistics prove that workers produce more, have fewer accidents and in general, do a better job—when temperature and ventilation are controlled in working areas.

Chelsea industrial fans are designed to meet any cooling or ventilating requirement in your plant. Let a Chelsea engineer show you how you can increase production and performance with proper ventilation. Then install low-cost Chelsea fans—you'll profit from their performance on any industrial cooling or ventilating job.

Sold only through authorized industrial distributors.

C H E L S E A
FAN & BLOWER CO., INC.

PLAINFIELD, NEW JERSEY

1926-1956 — More than 30 years service to the ventilating industry



RELOADING TANK with 50-lb bag of corn grits for another cleaning job. Tank holds 100 lbs of grits. Note hose support over wheel.

transported to the field to do on-the-site cleaning jobs. Two hooks welded to the tank facilitate lifting it on trucks at the shop. Skids are generally used to load and unload it in the field. Frequently, portable air compressors are used in field operation to provide the necessary air stream.

Since no booth is used, confinement of grit particles presents a problem. When used in the K-W shop, motors are usually suspended in front of a spray booth to take advantage of the exhaust facilities and keep the grit residue within a relatively small area. When used in the field, a light-weight plastic tent on rope supports is usually erected over the equipment to be cleaned. Where feasible, a heavy-duty vacuum cleaner can be used to suck up the grit particles from the floor and deposit them in a bag. Blasted grits are never reused on another cleaning job. They are sufficiently soaked with grease, oil and dirt particles to make this impractical.

Corn grits blasting has effectively replaced steam cleaning in the K-W operations. It does a job that is as good, or better, and there is no wait to dry out the equipment after cleaning.

With the substitution of ground walnut shells for corn grits, the same technique and the same equipment can be used to clean metal parts (dislodge paint, rust and other dirt particles) of large and small motors. This method could be used in preference to sand blasting techniques. As with corn grits for motor windings, it is particularly applicable to large equipment in the field.

Wheeled Cradles Handle Large Armatures

A series of home-made rolling cradles used by the Consolidated Electric Motor Co., New York City, facilitates the winding and transporting of heavy armatures. Made in several sizes to accommodate shafts of varying lengths, the cradle eliminates a lot of handling by hoist between the various repair and testing operations.

Once on the wheeled stand, an armature can be pushed from one step in the process to the next, whether the job to be done is a simple repair or a complete rewind. If a delay is encountered, the entire stand can be pushed out of the way in any convenient spot until work is to proceed.



ROLLING CRADLE (above) consists of two V-shaped rests at either end to receive the ends of the armature shaft, supported by a sturdy steel frame and mounted on wheels. Rewinding (below) is accomplished with armature in place on the cradle.



**ELECTRIC
FEEDRAIL®**

**...the trolley busway
that provides moving
power outlets**

FEEDRAIL Trolley Busways will put your testing on the same smooth, automatic basis as your regular production and assembly operations.

The reason — FEEDRAIL is a mobile system of electrical distribution. It consists of a series of electrified track sections from which easy rolling trolley outlets take off power and provide a continuous flow of current to the equipment being tested. This allows work to flow from station to station without interruption throughout the entire test process.

FEEDRAIL is available in capacities from 60 up to 500 amperes. Straight, curved and sectionalizing track sections allow you to meet any test requirement—any desired work flow.

GET THE FACTS

Descriptive literature containing full engineering data on FEEDRAIL Trolley Busways will be sent on request. Address Dept. C-2

SOLD BY MORE THAN 1,000 ELECTRICAL DISTRIBUTORS FROM COAST TO COAST
T4-1

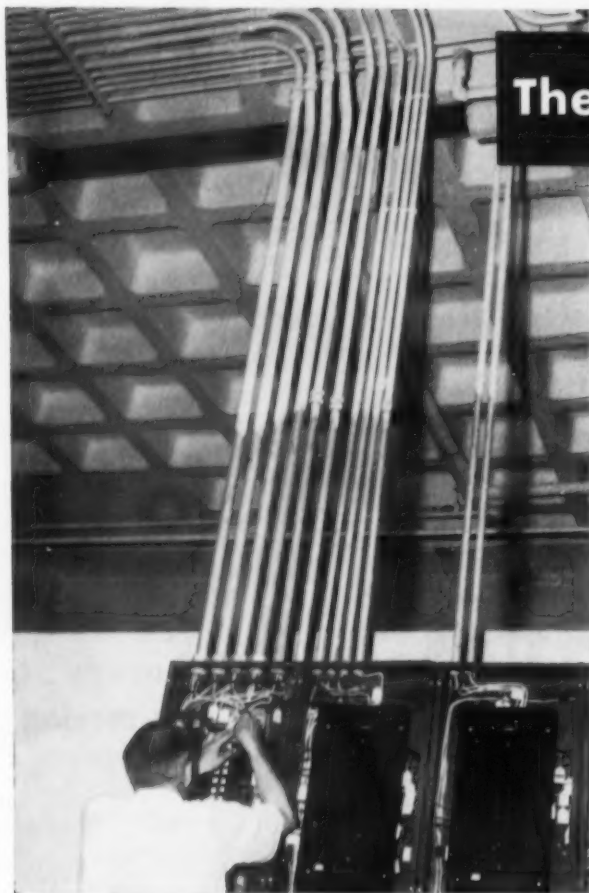


Never Becomes Obsolete

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.
125 BARCLAY STREET • NEW YORK 7, N. Y.

SPECIALIZED QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES



The Best Costs Less Installed

**Quality Steel in Republic
"INCH-MARKED" E.M.T. assures**

SMOOTH BENDING EVERY TIME

INSIDE KNURLING—a Republic exclusive—makes wire-pulling up to 30 per cent easier. Republic's exclusive ball-bearing type inside surface is the secret. It's available on $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1" sizes of Republic ELECTRUNITE E.M.T.

TRUE OFFSET, BACK-TO-BACK AND SADDLE BENDS are easy to make with Republic ELECTRUNITE. Cold rolled open-hearth steel coupled with rigid manufacturing controls assure uniform ductility in every inch of tubing to make bending easy and accurate. And the special galvanized finish will not chip, flake, or peel when tube is bent.

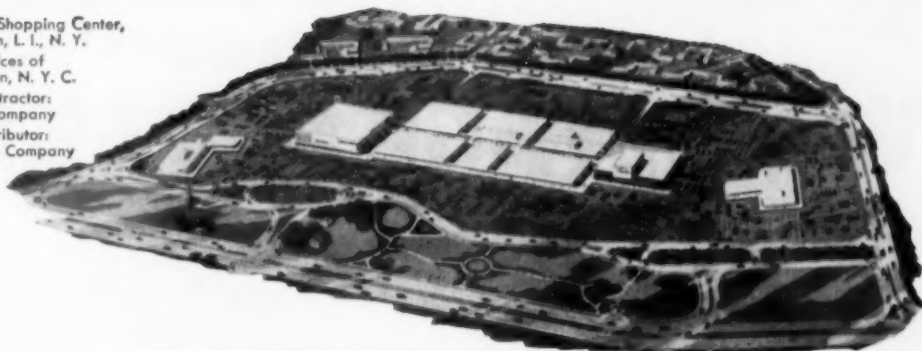


REPUBLIC



World's Widest Range of Standard Steels

Green Acres Shopping Center,
Valley Stream, L. I., N. Y.
Architect: Offices of
Irwin S. Chanin, N. Y. C.
Electrical Contractor:
Arc Electric Company
Electrical Distributor:
Heron Electric Company



No worries from costly kinks, says electrical contractor on big Long Island shopping center job

"We have discovered that not all electrical raceways have the *uniform ductility* of Republic ELECTRUNITE® E.M.T. This smooth-bending feature makes our job easier, practically eliminates waste."

One reason lies in the quality Republic steel used in the manufacture of ELECTRUNITE E.M.T. Republic's own ore is open-hearth refined and cold-rolled to precise tolerances. The raceway is then formed and welded by Republic's famous ELECTRUNITE process. From start to finish every step is carefully controlled to assure complete ductility and uniformity.

Arc Electric Company, electrical contractor on the huge Green Acres Shopping Center at Valley Stream, Long Island, is typical of leading contractors all over the country who have found Republic ELECTRUNITE E.M.T. both easy and economical to install.

Measuring distance is easier because the entire length of raceway is "INCH-MARKED"® in feet and inches. Bends are easier to make accurately—and without costly "wows"—due to the handy, longitudinal "Guide-Line". And wire pulling or pushing is easier because of the knurled "ball-bearing" inside surface of the raceway.

EXCLUSIVE LONGITUDINAL "GUIDE-LINE" extends full length of tubing. By aligning with arrows on Republic Bender, it is easy to keep bends in the correct plane, avoid costly "wows". Tubing is "INCH-MARKED" in feet and inches for quick measurement and to help in obtaining precisely the right height of bend. Both features on all popular sizes.



STEEL

and Steel Products

All are Republic exclusives.

Take a tip from successful electrical contractors and install Republic ELECTRUNITE E.M.T. on your next job. Just ask your electrical distributor for the raceway that's "INCH-MARKED" and "GUIDE-LINED" and prove to yourself why the *best costs less* installed. For additional information, send coupon.



EXCELLENT FOR CONCRETE, Republic ELECTRUNITE E.M.T. is 100% approved by the National Electrical Code for concealed, exposed, and concrete-slab installations. It provides effective protection for all electrical circuits, call systems, and television leads from moisture, fire and mechanical injury. Millions of feet have been installed successfully in every conceivable type of concrete installation.

REPUBLIC STEEL CORPORATION
Steel and Tubes Division
212 East 131st Street
Cleveland 8, Ohio

Gentlemen:

Please send me additional information on Republic ELECTRUNITE "INCH-MARKED" E.M.T.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

C-2000

CHECK HIDDEN FEATURES of Allis-Chalmers Individually Enclosed LOW VOLTAGE BREAKERS

Safe, Easy to Inspect... Simple, Easy to Mount

1. Easily accessible — Removal of deep front cover permits inspection and maintenance of breaker from front or sides.

2. Easy breaker removal — Pull-out construction permits removal without disconnecting cables. Cable connections are accessible through entire front opening.

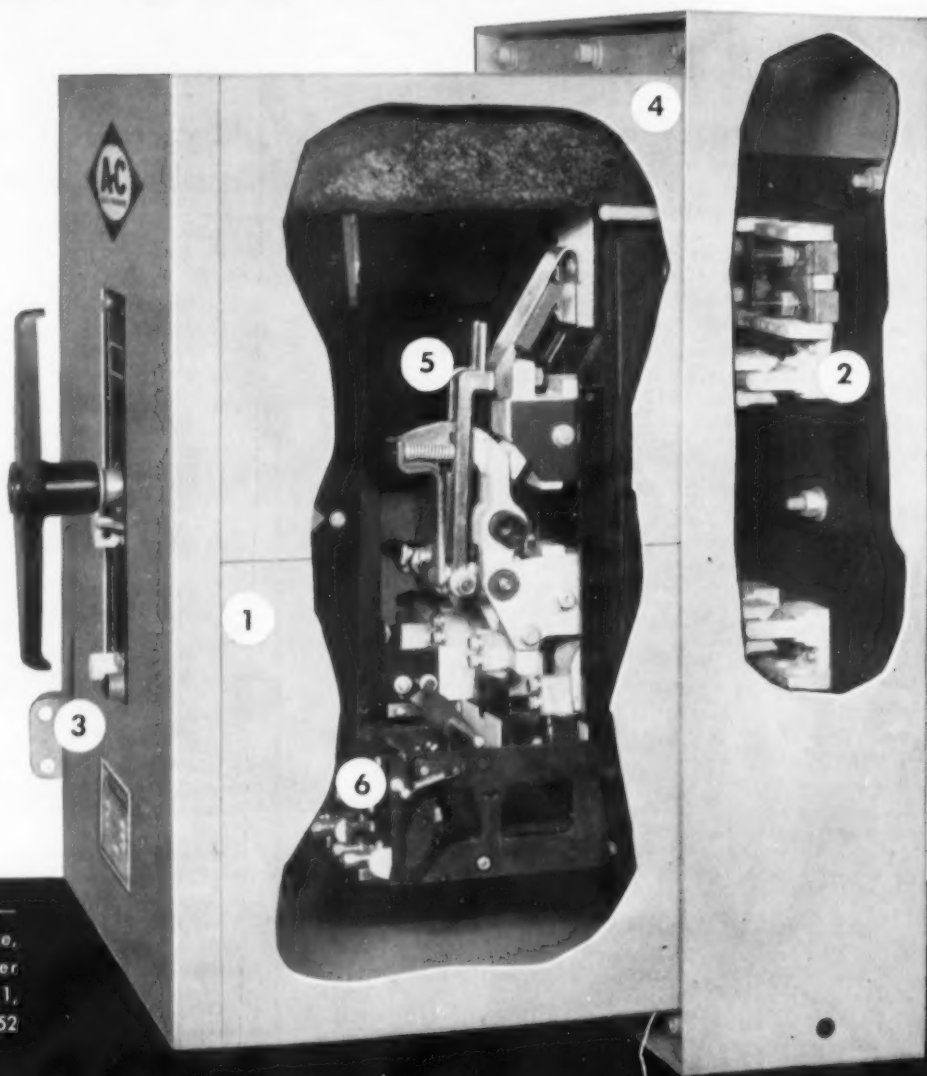
3. Safety Interlock — Prevents removal of cover while breaker contacts are closed.

4. Enclosures to meet your needs — Weather-proof or dust-proof as well as standard general purpose enclosures are available.

5. Long life contacts — There's no bounce—less erosion — due to high contact pressure with blow-on type action.

6. Accurate time-delay control — Hermetically sealed, positive displacement trip device is used.

*For service to 600 volts ac,
1600 amperes continuous,
50,000 RMS amperes in-
terrupting at 600 volts ac.*



Get details, dimensions, prices —
Contact your nearby A-C office,
or write Allis-Chalmers, Power
Equipment Division, Milwaukee 1,
Wisconsin, for Bulletins 18B8252
and 18B8283.



PUBLIC BUILDINGS



INDUSTRIAL PLANTS



UTILITIES



ATHLETIC FIELDS



BUSINESS PLACES



THEATERS

ALLIS-CHALMERS



A-5220

FOR MORE INFORMATION ON

NEW PRODUCTS CATALOGS, BULLETINS ADVERTISEMENTS

USE THESE CARDS ➡

● **PRODUCT NEWS, PRODUCT BRIEFS:**

Use first line of boxes. Insert item numbers of products on which more information is desired.

● **CATALOGS, BULLETINS AND ENGINEERING DATA:**

Use second line of boxes. Insert item numbers of literature desired.

● **ADVERTISEMENTS:**

Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

IMPORTANT...

- PLEASE PRINT LEGIBLY.
- USE BLACK OR DARK BLUE INK.
- DO NOT USE PENCIL OR RUBBER STAMP.

Please send me without obligation further information about the following:

2-57

Product News and Product Briefs, Item Number

--	--	--	--	--	--	--	--

Catalogs and Bulletins, Item Number

--	--	--	--	--	--	--	--

Advertisement on Page

--	--	--	--	--	--	--	--

NAME TITLE

COMPANY

ADDRESS

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication
NOT GOOD AFTER APRIL 1, 1957

Please send me without obligation further information about the following:

2-57

Product News and Product Briefs, Item Number

--	--	--	--	--	--	--	--

Catalogs and Bulletins, Item Number

--	--	--	--	--	--	--	--

Advertisement on Page

--	--	--	--	--	--	--	--

NAME TITLE

COMPANY

ADDRESS

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication
NOT GOOD AFTER APRIL 1, 1957

Your Name and address will be reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.

PLACE 3¢
STAMP
HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N. Y.

PLACE 2¢
STAMP
HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N. Y.

Your Name and address will be reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.

FOR MORE INFORMATION ON

NEW PRODUCTS CATALOGS, BULLETINS ADVERTISEMENTS

← USE THESE CARDS

● PRODUCT NEWS, PRODUCT BRIEFS:

Use first line of boxes. Insert item numbers of products on which more information is desired.

● CATALOGS, BULLETINS AND ENGINEERING DATA:

Use second line of boxes. Insert item numbers of literature desired.

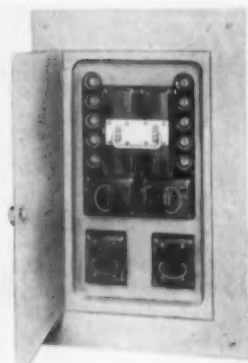
● ADVERTISEMENTS:

Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

IMPORTANT...

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL OR RUBBER STAMP

Product News



Main Switch

(1)

A new fusible service equipment unit that provides adequate protection for 240-volt home appliances and branch circuits. Unit is equipped with a 100-amp main disconnect for control of two 60-amp, 240-volt pullouts; two 30-amp, 240-volt pullouts; and ten plug fuse branch circuits. Non-interchangeable branch pullouts prevent overfusing; reversible puller heads indicate "on" or "off" position. Fusible service equipment, No. 14610, is available in flush or surface enclosures 23½ in. high, 3½ in. deep and 13½ in. wide. Data Sheet No. 1-255 is available.

Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J.



Lighting Units

(2)

New upright high bays in 20 and 24 in. diameters for 400-watt and 1000-watt mercury lamps, respectively. Uplights increase visual comfort by decreasing contrasts; 18% of the light illuminates upper areas. Units use color-improved mercury lamps. Maintenance costs are cut as lamps burn cooler and longer, and fixtures stay cleaner due to chimney sweep action of air currents. Wide distribution of light to illuminate both vertical and horizontal surfaces. Uplights are for use in industrial plants where the light source is distant from the working

level. A clear glass disc is provided on Uplight units when they are to be mounted in areas where moisture is likely to fall on the bulb. Literature is available.

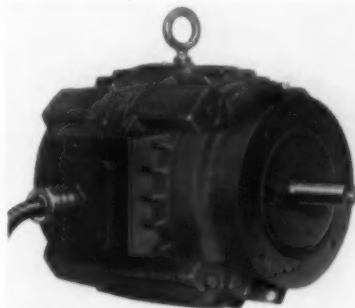
Spero Electric Corp., 20500 St. Clair Ave., Cleveland 17, Ohio

Receptacles

(3)

Shallow, flush mounted, single grounding receptacles are designed for grounding exposed metal parts of portable electrical equipment. Units are available in 125-volt, parallel slot, and 250-volt, tandem slot, ratings. Small, round, "shoulderless" body design permits mounting in restricted spaces, such as small floor boxes. Identical in size, the 125-volt unit, Cat. No. 5258, and the 250-volt unit, Cat. No. 5658, take up no more panel space than their face dimension. Each of these units, when fitted with a mounting flange, makes up a new female motor base. Male motor bases fitted with "U" shaped pin for grounding are also available for use with 3-wire, grounding type cord connector bodies.

Harvey Hubbell, Inc., Bridgeport 2, Conn.



Motors

(4)

A complete line of totally-protected, vertical solid shaft P-base motors for all vertical pump installations. Motors, with normal thrust bearings in all sizes from 1 to 40 hp and high thrust in sizes from 1 to 15 hp are available in protected, totally-enclosed, or explosion-proof enclosures. Standard enclosure for explosion-proof P-base motors meets UL specifications for performance under conditions covered by Class I, Group D, and Class II, Groups E, F and G. They are designed for indoor and outdoor installations. "Metermatic" lubrication automatically regulates correct flow of lubricant to bearings.

Reliance Electric and Engineering Co., 1088 Ivanhoe Road, Cleveland 10, Ohio



Solderless Lugs

(5)

A new line of solderless lugs with conductor diameter capacities ranging from 14 solid to 1000 mcm. Known as ShureLug, the line is available in single barrel, double barrel, and triple barrel models and in one hole, two hole, and four hole mounting styles. ShureLugs for No. 4 and larger cables are available with either hex head or Allen head screws. Smaller sizes have fillister head screws. They are produced from a special copper alloy and are cast in one piece. They carry U.L. approval.

O. Z. Electrical Manufacturing Corp., 262 Bond St., Brooklyn, N. Y.

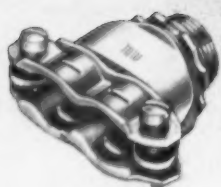


Connectors

(6)

New Stripsealed Eltaps, L-type compression connectors having both run and tap elements factory filled with Penetrox A oxide-penetrating corrosion-preventing joint compound have been introduced. A special plastic dip applied directly over the joint compound seals in the proper quantity on the connector contact surfaces. The dipping operation's duration and temperature are controlled to avoid melting the compound and to form a perfect seal. When ready to install the Stripsealed connector, the line-man strips the seal by pulling a rip tape, color-coded for cable-size identification. Eltaps are available for run conductors from Nos. 6 to 2 and taps from Nos. 10 to 2.

Burndy Corporation, Norwalk, Conn.



midwest

A Midwest quality fitting. "Quality" is just a condensed way of saying: "Getting the total job done — right — with the most inexpensive combination of material and man hours." Engineering and producing quality fittings to meet the highest standards of electrical wiring installations, is our objective at Midwest.

Midwest Electric Mfg. Company

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

1639 W. WALNUT STREET

Chicago 12, Illinois



Service Entrance Equipment (7)

A new 70-amp all-in-one meter socket-load center combination that bridges the gap between 50- and 100-amp service entrance requirements. The all-in-one design provides extra installation and servicing convenience for areas where the electrical contractor is required to supply the meter socket, and where outdoor location of service entrance equipment is desired. Utilizing a wired-in, 2-pole, common-trip, 70-amp Type TQL main circuit breaker, the new 70-amp load center permits savings to contractors who formerly have had to jump to 100-amp service equipment when a 50-amp box proved inadequate. This device has space for 14 single-pole branch circuits which includes capacity for up to three double-pole branches to feed ranges, dryers, or other 240-volt appliances. They are rated for 120-/240-volt ac, single phase, 3-wire services. Available in raintight NEMA Type 3R enclosures, they can be ordered for semiflush or surface mounting.

General Electric Co., Plainville, Conn.



High Voltage Starter (8)

A new high voltage starter, Type ZHA, 2200-4800 volts. Completely accessible from the front, starters may be mounted directly against wall or in double rows, back-to-back. Unit is 30 in. deep. It is self-contained, complete with control transformer supplying low voltage for pushbutton circuits. Type ZHA is also available with self-

contained bus in an isolated compartment. It is furnished in three interrupting ratings for squirrel cage, synchronous and wound-rotor motors. Class E1 50,000 kva; Class E2 with current limiting fuses and high interrupting capacity contactor. At 2300 volts: 150,000 kva, 3-phase; 60,000 RMS amps asymmetrical. At 4,800 volts: 250,000 kva, 3-phase; 60,000 RMS amps asymmetrical. Valimitor may be used on a bus of unlimited short circuit capacity, through the use of a contactor with an interrupting rating of 50,000 kva, and reactors which limit any fault current to a maximum of 25,000 kva. Bulletin 8130-F is available.

Electric Controller & Mfg. Co., division of Square D Company, Cleveland 28, Ohio



ELECTRONIC AIR CLEANER will be manufactured by Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave. So., Minneapolis 8, Minn. The dust laden air flows through a 13,000-volt ionizer section of the system. Given a positive electrical charge, the dust particles are attracted to negative (6,500-volt) collector plates. The unit contains no moving parts and is installed in the air duct system of air conditioning and ventilating systems.

Fittings (10)

New holding devices, called Hub-Lugs provide a quick fastening method which assures a moisture-proof, more durable mounting of fittings in the electric control and operating systems on machinery. Place Hub-Lugs over conduit, attach required fittings to conduit, slip Hub-Lugs back down over hubs on fittings, tighten with Allen wrench, then secure fittings to machinery through holes in wings of Hub-Lugs. They are made to fit the sizes and types of Ideal-Simplet rectangular fittings.

Ideal-Simplet Fittings Inc., 1041 Park Ave., Sycamore, Ill.



Ground Detector (11)

A high-voltage model of the standard Allen Ground Detector, can be applied to 2,300-volt and 4,160-volt circuits to locate fault grounds on energized underground distribution circuits and equipment. H-V model features a functional test button which allows sufficient current to flow to eliminate high resistance or arcing faults instantly in many cases, or establish the fault for quick location. Signal voltage does not exceed line voltage and does not impose strain on conductor insulation. Unit mounted on standard welder dolly for portability.

Excel Electric Service Co., Inc., 2113 S. Western Ave., Chicago 8, Ill.



Transformer Bushing (12)

A new fully-insulated bushing is now standard equipment on L-M transformers. Bushing has been designed to eliminate outages caused by pets, birds, and wild animals contacting transformer bushing terminals. A phenolic cap covers all exposed live parts of bushing. On protected transformers a slot for a lightning arrester terminal is included. An insulated knob, used to operate the terminal connector, will not spin out. All L-M round wound single-phase pole-mounted transformers rated 5 kv or more, up to 167 kva, are equipped with the new bushing. It is also standard on 3-phase transformers up to 150 kva.

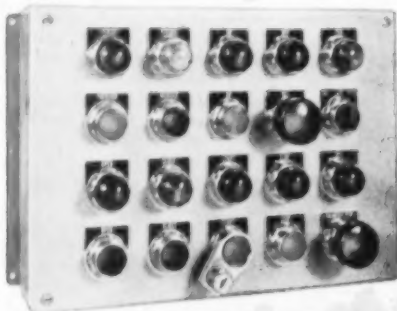
Line Material Co., 700 W. Michigan St., Milwaukee 1, Wis.

INTRODUCING THE

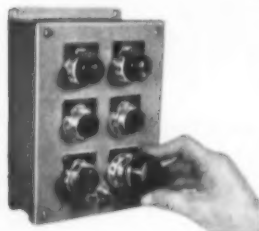
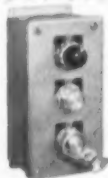
New

FURNAS ELECTRIC

Oil Tight PUSH BUTTONS



DESIGNED FOR EVERY APPLICATION



Now for the first time, because of standardization and interchangeability, more combinations of Oil Tight push buttons are available with fewer parts. As a result, Furnas Electric design and research again lead the field, this time with the finest oil tight push buttons available.

When you specify Furnas Electric, you get one standard contact block. No rights or lefts—no special units for horizontal or vertical mounting.

Accessories (key lock, mushroom head or lever) are mounted directly on all standard operators. Operators need not be modified or removed from panels.

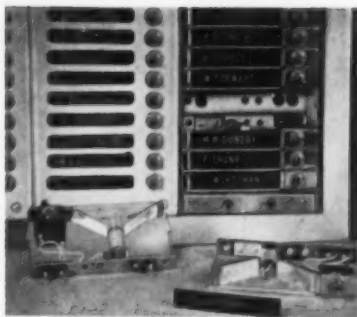
For full information on oil tight or general purpose push buttons, selector switches or pilot lights, write today for Catalog 5606. Furnas Electric Company, 1067 McKee Street, Batavia, Illinois.



FURNAS ELECTRIC COMPANY
BATAVIA, ILLINOIS

SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

A16

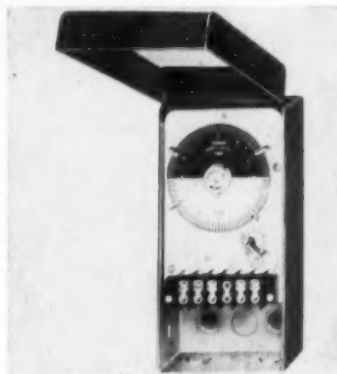


Registers

(13)

A new modular line of Staff In-and-Out registers featuring small size, installation flexibility, and easy maintenance. The line comprises both surface- and flush-mounted control, recording and recall registers. Combinations of all three register types can be integrated into a single system. The module is a group of 10 plug-in name-tile units measuring 6½ in. high by 5 in. wide for control and recall registers, 6½ in. high by 4 in. wide for recording registers. Name tiles and lamps are mounted in individual plug-in units, withdrawable for relamping or name tile changing.

S. H. Couch Company, No. Quincy, Mass.



Time Switch

(14)

A new time switch, Intermatic Series V22000, controls two electrical circuits at different times. They are especially suited for controlling lighting circuits in apartment houses, stores, factories and other public buildings. Switches permit varying timing periods from 30 minutes to 23½ hours. Models are available for various switching sequences. Housed in a steel case measuring 10 in. high by 4½ in. wide by 4 in. deep, it has a black crackle, rustproof finish. A permanently hinged door, with hasp, provides a dust and moisture-proof seal. Available for 125 or 250 volts. Bulletin NR No. 186 is available.

International Register Co., 2624 W. Washington Blvd., Chicago 12, Ill.



SEALTITE CARTON opens readily. Stock is easy to remove.

Now — handy cartons for Sealtite flexible, liquid-tight conduit

Sturdy cartons are easy to carry on job with you—simplify storage.



STURDY CARTONS stack without damage, are easily handled and stored. Clear markings make ready identification possible at all times.

For your many short-length jobs, the Sealtite cartons make this conduit extra easy and profitable to install.

1. Saves time—cut off what you need *on the job*. No waste—use leftovers on your next job.

2. Sturdy cartons are clean, easy to handle... can be stacked six or eight deep without damage to container. Easy to carry on the job.

3. Clear markings on both ends assure ready identification of type (U.A., E.F. or C.S.A.), color, size, footage at all times.

4. Conduit is easily removed for speedier handling on the job. Carton is opened without destroying its effectiveness as a container.

WHERE TO GET SEALTITE Electrical wholesalers stock Types U. A. and E. F.† Sealtite® flexible, liquid-tight conduit. Be certain you ask for, and get, the quality conduit marked "Sealtite" on the cover. Special liquid-tight connectors by Appleton, Thomas & Betts, Gedney or Pyle-National are available. Free Booklet 5-537 gives full information on Sealtite. Write: The American Brass Company, American Metal Hose Division, Waterbury 20, Conn.

†Trademark
1Pat. Applied for

57186C

Insist on the original

SEALTITE



flexible, liquid-tight conduit

an **ANACONDA**® product



Mr. E. C. Carter, Carter Electrical Construction Co., Pittsburgh, Pa.

"Hang quickly...line up easily"

"One of the biggest timesavers in the business is Day-Brite's 'A-J' adjustable stem hanger. Designed to let you hang fixtures quickly and line them up easily and accurately, the 'A-J' hanger is a real money saver.

"In a lot of ways, the 'A-J' is a small thing. But, it's the small things that count—often make a big difference in a job profit.

"That's why we like Day-Brite. The folks at the factory pay attention to the smallest details—have a complete understanding of the contractor's problems—make it easier for him to speed up installation."

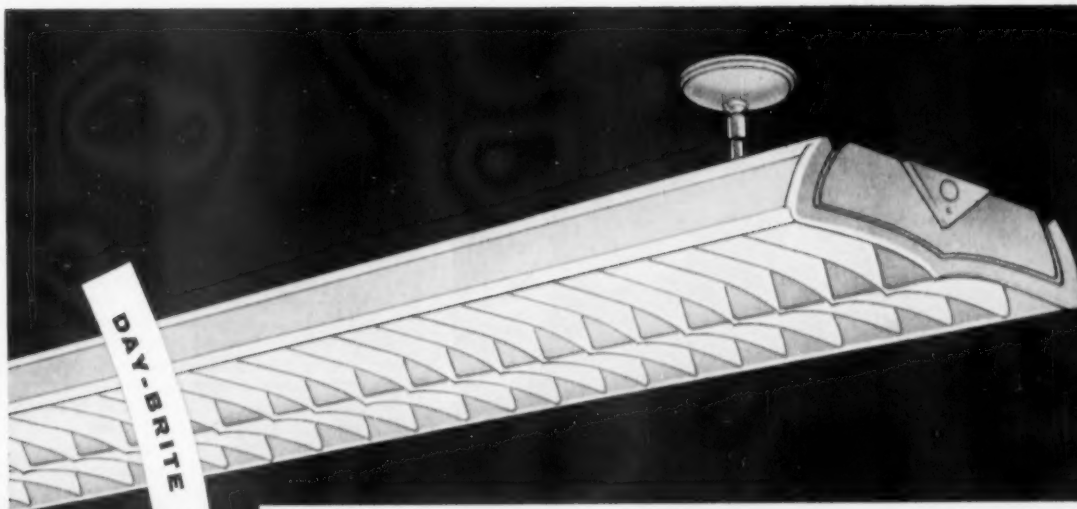
Mr. Carter isn't alone in his opinions of Day-Brite. Thousands of contractors throughout the country feel the same way. That's why Day-Brite is the top choice when quality and net profit are considered.



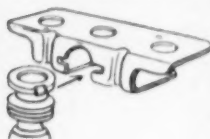
DAY-BRITE LIGHTING, INC.
5402 Bulwer Avenue, St. Louis, Missouri

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING FIXTURES

DAY-BRITE ON THE JOB MAKES THE BIG DIFFERENCE HERE



Fits anywhere, fast... Ceiling mounting bracket can be mounted to ears of outlet box, fixture stud or direct to ceiling. Slotted arrangement accepts top swivel fitting to hanger stem. No locknuts required.



Easy to level... Hand-operated adjustment can be made after installation is completed. Provides for one inch of vertical adjustment to allow lining up fixture runs.



Uneven ceilings no problem... Swivel-top fitting allows up to 15° realignment to compensate for uneven ceilings.



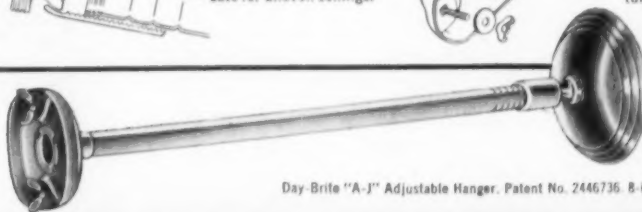
No setscrews in ceiling canopy... Self-centering is assured through offset knurled canopy ring; cannot go off-center.



No locknuts required... Bottom stem fitting machine-crimped to stem. Offset design assures easy locating and positive self-centering into bottom canopy.



No tools needed... Wing nuts provided for easy attachment of fixture to hanger. Used at ends and coupling points of fixture runs.



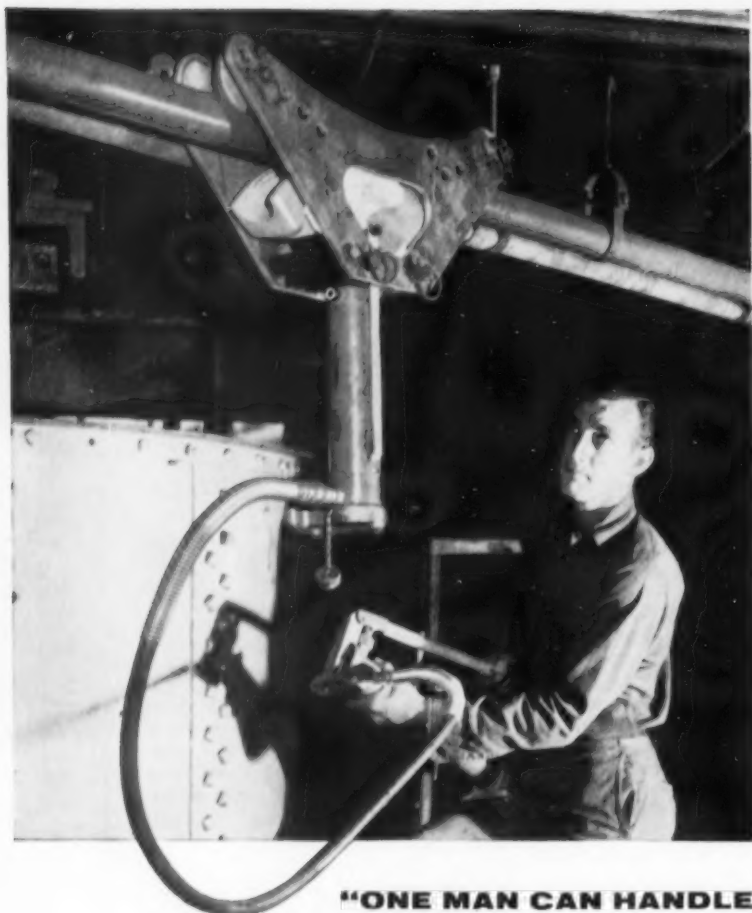
Day-Brite "A-J" Adjustable Hanger. Patent No. 2446736. 8-inch, 12-inch, 24-inch.

71113

WEEKLY TIME CARD

Name John Smith
 Time Card for Week Ending Feb. 12 195 7
 Job No. 123 Job Description Third National Bank

HOURS		MON	TUE	WED	THU	FRI	SAT	SUN
From	To							



**"ONE MAN CAN HANDLE
ALMOST ANY CONDUIT PROBLEM
with a portable Greenlee Hydraulic Conduit Bender,"**

says R. A. Branford, Chief Electrician, C. F. Church, Monson, Mass.

Pictured above is another unusual conduit bending job being performed by the No. 880 GREENLEE Lightweight Hydraulic Bender. It's being used to form offsets in an existing conduit and "raise it," so that new machinery can be moved under it without interfering with electrical service.

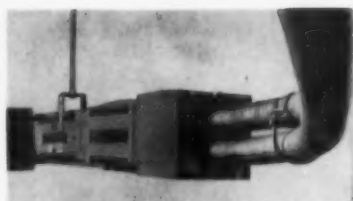


In reporting on this work at C. F. Church Division of American-Standard, Monson, Mass., Chief Electrician R. A. Branford says that the GREENLEE Bender saved eight hours of work and about \$25 in fittings, plus large savings in the form of non-interruption of plant operations. You'll find many timesaving and

moneysaving advantages in having a GREENLEE Bender on your jobs, too. Portable, one-man carried, one-man operated. *Makes full 90° bend with one ram stroke.* Quickly makes the exact bends you need in all sizes of conduit and pipe from 1/2" to 2". Entire unit is easily used on the floor, on a bench, or aloft as shown above. Easily operated with hand pump or can be teamed with a GREENLEE power pump for fast production jobs. Write for complete details.



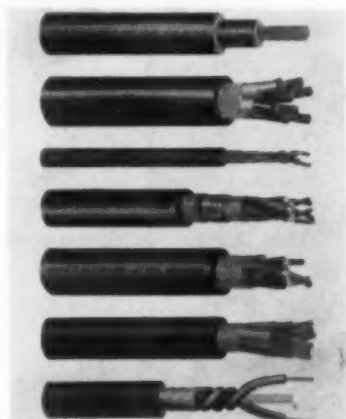
GREENLEE TOOL CO., 1742 COLUMBIA AVENUE, ROCKFORD, ILL.



Distribution Systems (15)

New Uni-bus power distribution systems available combine low-impedance characteristics and plug-in construction. Special plug-in units and interlocked plug-in opening covers provide maximum safety during installation and relocation. Bus bars are covered until plug-in devices are fastened to busway over the plug-in opening. Uni-bus 3-pole housings are the same for all ratings; they measure 3 1/2 in. by 7 1/4 in. Busways are available in copper or aluminum with single run ratings of 225, 400, and 600 amps in 2-, 3-, and 4-pole housings. An 800-amp rating is available in copper only.

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

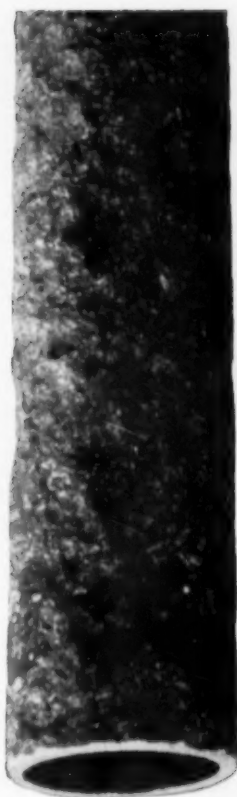


Cable (16)

Two kinds of Type USE, Style RR nonmetallic-sheathed 600-volt cable is being offered under the Bronco label. One is suitable for direct burial in the earth, the other is a general purpose cable designed for raceways, ducts, or open wiring. Both are made with a Neoprene outer sheath which is branded with full identifying data every 2 ft. and heat-resistant, superaging rubber insulation. Both kinds are available with either solid single conductor, sizes 14 AWG through 8, or a stranded single conductor, sizes 14 through 4/0.

Bronco 66 Certified Type SO shielded cords are now made with two, three or four conductors, sizes 18 through 10. The 66 shielded control cables are made with five, six, eight, ten, or 12 color-coded conductors, sizes 18 to 14.

Western Insulated Wire Co., 2425 East 30th St., Los Angeles 58, Calif.



WHICH ONE ...for the safety of your installation?

Yes, both are rigid steel electrical conduit—but that's where the similarity ends! The National Electric Sherarduct conduit (on the left) is different in one vital way—it is life-time protected by the unique Sherardizing process of dry galvanizing which actually alloys pure corrosion-proof zinc to the steel walls—threads and all. That's why you'll never see Sherarduct deteriorate like ordinary conduit (on the right). For thousands of structures, this Sherarduct protection has meant conduit life way beyond the life of the building.

A Sherarduct installation is the

true mark of a quality wiring job. It means positive protection of the electrical system with no costly conduit replacements due to corrosion.

Remember these factors—and what they can mean to your installation. Make sure NE Sherarduct is specified for your job.

Sherardizing is Galvanizing at its Best!



Sherarduct is Galvanized Conduit at its Best!

National Electric Products

PITTSBURGH, PA.

2 Plants • 11 Warehouses • 35 Sales Offices

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . FEBRUARY, 1957



Blackhawk's NEW One-piece Box Support

Speeds up work Simple

A single piece that goes in easily and stays put — frees the electrician's hands for the work.

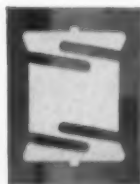
Quick

The Blackhawk patented one-piece box support is installed all at once — permits more jobs, more profits.

Permanent

The Blackhawk box support provides rigid, unified support because it is a large, single piece — does not wiggle or saw, because it is parallel to the wall.

Superior installation in seconds



Ask Your
Electrical Distributor

Cat. No. 540
Patent No. 2518912

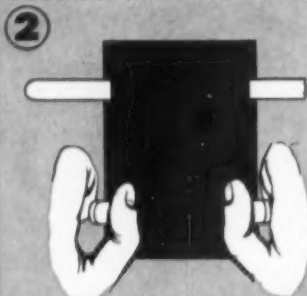
Specify B-1 when you buy!

BLACKHAWK INDUSTRIES

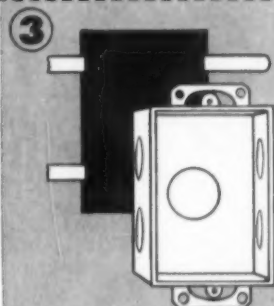
DUBUQUE, IOWA



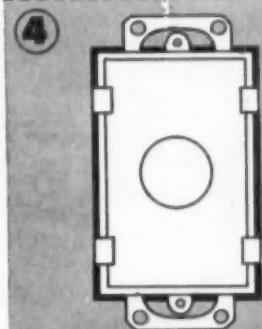
The Blackhawk One-Piece Box Support is inserted all at once — no extra parts to handle or drop.



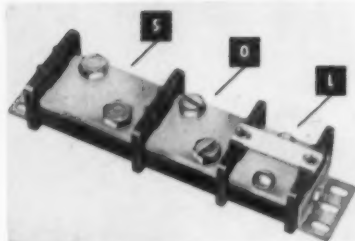
Tabs are simply bent around the wall edge, and the Blackhawk Box Support is ready to receive the switch box.



Both hands are free to install the box. Meanwhile the Blackhawk One-Piece Support takes care of itself.



Tabs are bent to the inside of the box, holding it tight. The broad, single support surface does not wobble or cut.

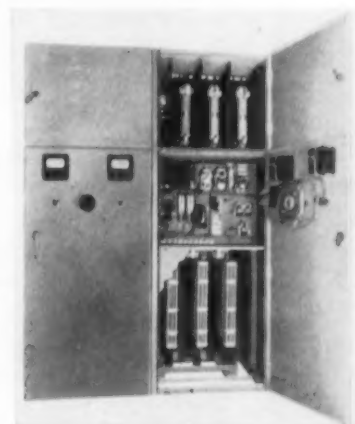


Terminal Blocks

(17)

Three new terminal blocks designated as Types "S", "O" and "L" have been developed for power wire termination. Any numerical combination of these three types may be had in the same block, or they may be combined in suitable combinations with Curtis "H", "BT" and "BS" terminal sections to provide control and power wire terminals on the same block. Types "S", "O" and "L" are rated 750 volts, ac terminal to terminal and terminal to ground. Type "L" rated 100 amps, Type "O" rated 125 amps and Type "S" 225 amps.

Curtis Development & Mfg. Co.,
3250 N. 33rd St., Milwaukee 16, Wis.



Motor Starters

(18)

High voltage combination motor starters, type FPA, provide high interrupting capacity for 2300-4800-volt squirrel-cage, wound rotor and synchronous motors. Other features include steel-enclosed fuse compartment; individual fuse isolation by full depth phase barriers; electrical series door interlock with automatic circuit opener; removable contact barrier with assembly access from front or rear. Suitable for control and protection of all types of 3-phase, 50-60 cycle ac motors operates at 2300-4800 volts with the following ratings: 900 hp, unity pf, 2300 volts; 700 hp, 0.8 pf, 2300 volts; 1500 hp, unity pf, 4800 volts; and 1250 hp, 0.8 pf, 4800 volts. Interrupting ratings are: 150,000 kva at 2300 v; 250,000 kva at 4160-4600 v.

Federal Pacific Electric Co., 888
Keyser Ave., Scranton, Pa.



THE "GENERAL" ADDS TEN NEW STARS



Atlanta, Georgia
Baltimore, Maryland
Boston, Massachusetts
Chicago, Illinois
Cincinnati, Ohio
Cleveland, Ohio
Dallas, Texas
Dayton, Ohio
Denver, Colorado
Detroit, Michigan
Greensboro, North Carolina
Indianapolis, Indiana
Kansas City, Missouri
Lincoln, Nebraska
Los Angeles, California

Memphis, Tennessee
Milwaukee, Wisconsin
Minneapolis, Minnesota
Newark, New Jersey
New Haven, Connecticut
New Orleans, Louisiana
Philadelphia, Pennsylvania
Pittsburgh, Pennsylvania
Portland, Oregon
St. Louis, Missouri
San Francisco, California
Seattle, Washington
Springfield, Illinois
Syracuse, New York
Tampa, Florida



Backing up our Authorized Distributors' stocks, General Cable now adds 10 New Distributing Centers to its nationwide operation. Now, to keep pace with soaring demands, there will be 40 General Cable Distributing Centers fully stocked to meet our Authorized Distributors' wire and cable requirements.

Rely on General Cable's Authorized Distributor stocks for superior quality, unequalled service and availability for all your wire and cable needs.

GENERAL CABLE CORPORATION
420 Lexington Avenue, New York 17, New York
Offices and Distribution Centers Coast-to-Coast.



for quality and service...specify **GENERAL CABLE**

your distributor now has
these **3 NEW RAWL PRODUCTS**
FOR FASTER, BETTER
ANCHORING IN MASONRY...

Be sure of your anchoring work. Use the best anchors. To begin a good job right specify Rawl.

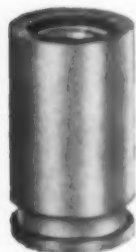
Here are some new additions to the Rawl Product line... If you're not familiar with all our products why not let us send you a catalog?

RAWL DRILL-HAMMER



CONVERTS AN ELECTRIC DRILL, ECONOMICALLY, INTO A DEPENDABLE, FAST, POWER HAMMER. MORE THAN DOUBLES THE VALUE OF YOUR 1/4" ELECTRIC DRILL.

Drill quickly into softest or hardest masonry or stone with inexpensive Rawldrills. Saves money — eliminates necessity for using expensive carbide-tipped drills. Automatic clutch starts or stops action automatically when the drill point touches or is taken away from work. "Light", "medium" or "heavy" blows are selected by turning the collar. RAWLDRILLS TO FIT.



RAWL CALK-IN

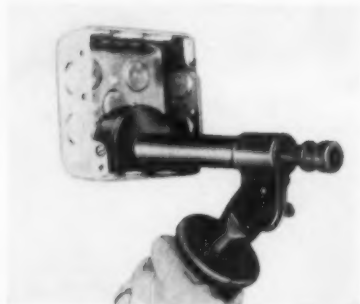
Improved machine screw anchor. Sleeve is precision-cast of an exclusive Rawl lead alloy, especially developed for masonry anchors. It's just soft enough for easy, complete caulking and hard enough for tremendous holding power. Sizes up to 5/8".



RAWL SCRU-LEAD

The most holding power possible with any lead screw anchor. Exclusive Rawl lead alloy used for easy installation and huge holding power. The top flare out speeds up anchoring time because screws can be inserted quickly. Use for either wood screws or sheet metal screws.

Write for free new dimensional wall chart and catalog.



Stud Driver

(19)

Hand stud driver equipped with a safety handle that will set studs in steel or concrete. The safety handle is removable and adjustable to any position which makes close work in deep channels or boxes possible. The rubber safety grip of the "Rap-it" tool is removable and fits on the safety handle which slips on the body of the tool and is fastened in position by thumb screw.

Fastening Devices Inc., 369 Fiftieth St., Brooklyn 20, N. Y.



Benders

(20)

A new line of 3- and 4-in. hydraulic pipe and conduit benders. A 90-degree bend can be made with one stroke of the ram in pipe through 3 in. and three setups in 4-in. pipe. All new models come equipped with "Optik-Angle" gauge. All models are constructed of lightweight aluminum and have removable top plates for pipe positioning. Newly designed rams have long-stroke plungers. All rams have self-retracting springs built in.

Blackhawk Mfg. Co., 5325 W. Rogers St., Milwaukee 46, Wis.

Ballasts

(21)

A complete line of indoor and outdoor ballasts for both 0 and 50F operation of two 48- and 96-in. power-groove and very high output fluorescent lamps is now available. Starting is provided by two companion ballasts. Operation of the high intensity lamps with two ballasts instead of one pro-

vides a more suitable distribution of heat from wattage losses and ballast weight. As with 800 ma rapid-start systems, care should be exercised by fixture manufacturers in applying these new ballast-lamp combinations. Pendant type fixtures mounted 8 in. or more from ceiling with bottom and top of fixture open and no lamps positioned directly below ballast compartment are most likely to provide adequate ventilation.

General Electric Co., Schenectady 5, N. Y.



Hanger

(22)

Micro-hanger for fluorescent lighting fixtures features micromatic vertical adjustment up to 1 in. A twist of the stem aligns and levels fixtures in continuous rows or in individual unit installations. Hanger includes ball socket for flexible mounting, in any direction, on ceilings up to 40° slope. Available in six different lengths. Literature Form No. 958 available.

Edwin F. Guth Company, 2615 Washington Blvd., St. Louis 3, Mo.



Receptacles

(23)

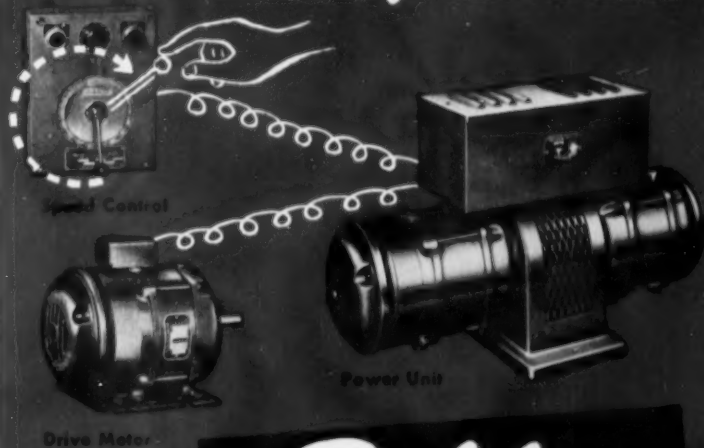
A complete line of outlets, called Sierraplex, both 2-wire and grounding-type; single and duplex; in either tandem or parallel slots; available in a new contemporary design. Complementing these outlets are matching Sierra wall plates in a wide variety of combinations and sizes in either plastic, stainless steel or brass. Available in ivory or brown.

Sierra Electric Corp., 15100 So. Figueroa St., Gardena, Calif.

30-STEP SPEED CONTROL

WITH A

twist of the wrist!



Baldor
ADJUSTABLE SPEED
MOTOR SYSTEM

- Easy to install...simple to service!
- No troublesome protective relays!
- No flashing contactors!
- No complicated electronic adjustments!

Specially designed for machines where friction or torque is constant from high to low speed. Motor-generator set, controller and drive motor can be mounted independently, in any position.

- One control for all adjustments. 0 to 2400 RPM in 30 steps of 80 RPM, forward or reverse.
- Totally enclosed Streamcooled construction... vernier rheostat for infinite speed control between steps... jog switch for machine adjustments... reversing switch changes rotation... many other features.
- Ideal for use on conveyors, pumps, mixers, shaker screens, packaging machines, fans and blowers, farm machinery, governor controls, similar machines.

For complete engineering data
write for Bulletin SP-600

BALDOR ELECTRIC COMPANY

4333 DUNCAN AVE.

ST. LOUIS 10, MISSOURI

NEW! PORTER® QUIK-STIK POLYETHYLENE ELECTRICAL TAPE

PORTER SINGLE-PAK
($\frac{3}{4}$ in. x 66 ft.)



Remains flexible in cold weather!



Check the outstanding features of this one wrap primary insulation tape!

- Remains flexible from -70°F to $+200^{\circ}\text{F}$.
- Total dielectric strength more than 10,000 volts.
- Maintains constant power factor over extremely wide frequency range.
- Resists corona conductivity; moisture; oils; greases; solvents; chemicals; fungi; bacteria; abrasion; creep; aging.
- Physically stable; non-corrosive; non-drying; non-polarizing; chemically inert.

Order from your wholesaler today!

For free brochure, write to: H. K. Porter Company, Inc.
Quaker Rubber Division, Philadelphia 24, Pa., or
Quaker Pioneer Rubber Division, Pittsburg, Calif.

H.K.P. QUAKER RUBBER DIVISION
QUAKER PIONEER RUBBER DIVISION
H. K. PORTER COMPANY, INC.

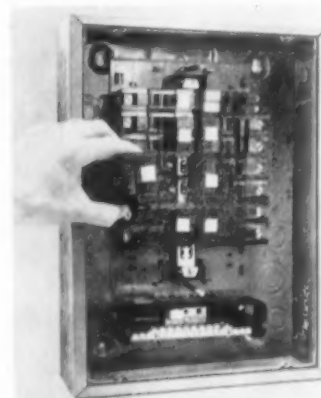


Identifier Tags

(24)

Conduit and circuit identifier tags provide a positive conduit check-off system at time of installation. Prevent conduit mixup for light, power, low tension. In use tags are typed out or written using a ball point pen. All information from plan is copied onto tag for each run, fasten tag to clip attached to conduit seal, insert tag into conduit. Bushing is tightened and data remains available when wanted. Conduit seal stock sizes $\frac{1}{2}$ to 3-in., tag measures 2 by 4 in.

Walter J. Law, 1081 Gerard Ave., New York 52, N. Y.



Enclosures

(25)

The entire line of Stab-lok enclosures is now sequence bussed to meet field requirements for more two pole circuits. Two new units, the AB120-1 and 116-1, round out the line of 37 standard and 12 "special application" devices.

The line features reduced depth $3\frac{1}{4}$ in. boxes to fit standard two by four "dry-wall" construction, step-type neutral lugs and surface-flush enclosure design. All block units contain combinations of both "B" and "F" slots to allow insertion of either two single pole or 15- or 20-amp, $\frac{1}{2}$ -in. wide NC breakers or one single pole 15 to 50 amps, 1-in. wide NA breaker in the same amount of space.

Federal Pacific Electric Co., 50 Paris St., Newark, N. J.

Heat Pumps

(26)

A new packaged heat pump for year-round residential and commercial air conditioning. Also a new series of assemblies for "applied" or field-engineered heat pump systems for larger buildings. The heat pump Weather-maker employs outdoor air as a source of heat and is divided into two units, with an indoor unit little larger than a room air conditioner. It can be installed in an attic, basement, or top of closet. The Weathermakers will be introduced initially in a 5-hp model and will be available in sizes ranging from 10 to 125 hp.

Carrier Corporation, Syracuse 1, N. Y.



Proximity Relay

(27)

A new proximity relay operating on the principle of electrical capacitance. Unit can be applied as a level control of non-conductive liquids, granular or semi-solid materials; as non-contact limit switching, interface control, batching, moisture measurement, counting and as a safety device. Negligible potential probe design permits use in hazardous areas. Probe and case are connected by coaxial cable specially designed for heavy-duty industrial applications. Unit can be flush or surface mounted. Relay operates on 115 volts, 60 cycle, single-phase. Power consumption, 10 watts maximum.

Excel Electric Service Co., Inc., 2113 S. Western Ave., Chicago 8, Ill.

Safety Switch

(28)

A new 30-amp, 600-volt Style HCI safety switch, measuring 7½ in. wide by 9½ in. high by 5½ in. deep. It is available in both heavy and normal duty models, and in oiltight NEMA Type 12 enclosures for industrial applications. A front-operated handle on the heavy duty models makes close ganging easy. The double-break HCI pole units can be individually replaced, and front fusing on both models allows quick access to the fuses.

General Electric Co., Plainville, Conn.



ALUMINUM

OR GALVANIZED STEEL

SUPPORT SYSTEMS

FOR POWER AND CONTROL CABLES

IN-FREE-AIR

DESIGNED AND DEVELOPED BY HUSKY PRODUCTS

Mr. Contractor...

HUSKY Service Drawings*
cuts down Labor Costs



- We make field erection a simple assembly job.
- We can make take off layouts from drawings furnished by you.
- We eliminate guess work with our service drawings.
- We guarantee our detailed layout on basis of drawings furnished by you.
- **NO OTHER MANUFACTURER OFFERS SUCH SERVICE.**

ONLY HUSKY OFFERS YOU

- ★ Detailed Service Drawings
- ★ Greatest Length
- ★ Fewer Pieces to Handle

Don't

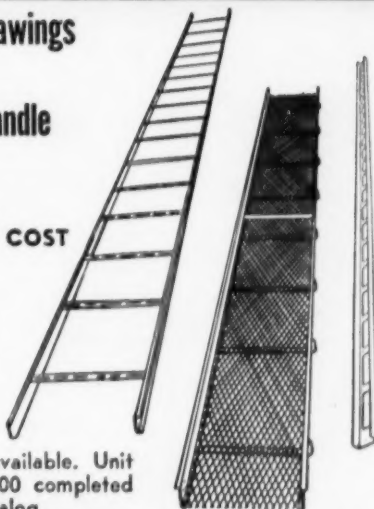
COMPARE MATERIAL COST

Do

COMPARE INSTALLED COST

- * Small service fee on small jobs.
- FREE on large jobs.

Design and layout assistance available. Unit responsibility assumed. Over 3000 completed installations — Send for free catalog.



AVAILABLE THROUGH LEADING CABLE MANUFACTURERS

HUSKY PRODUCTS, INC.

5300 VINE STREET, CINCINNATI 17, OHIO

A NEW IDEA IN POWER DISTRIBUTION

WESTINGHOUSE

UNI-BUS



From Westinghouse comes a new busway—a method of distributing power—so new, so much better, it makes conventional methods seem old fashioned. Uni-bus!

For the first time, it combines the advantages of plug-in duct with a low-impedance system.

And Uni-bus has a new idea in installation . . . the flexible connector. This one unit does away with all special fittings—simplifies time-consuming field measuring. This feature combines with special clip-on hangers to effect time savings during installation.

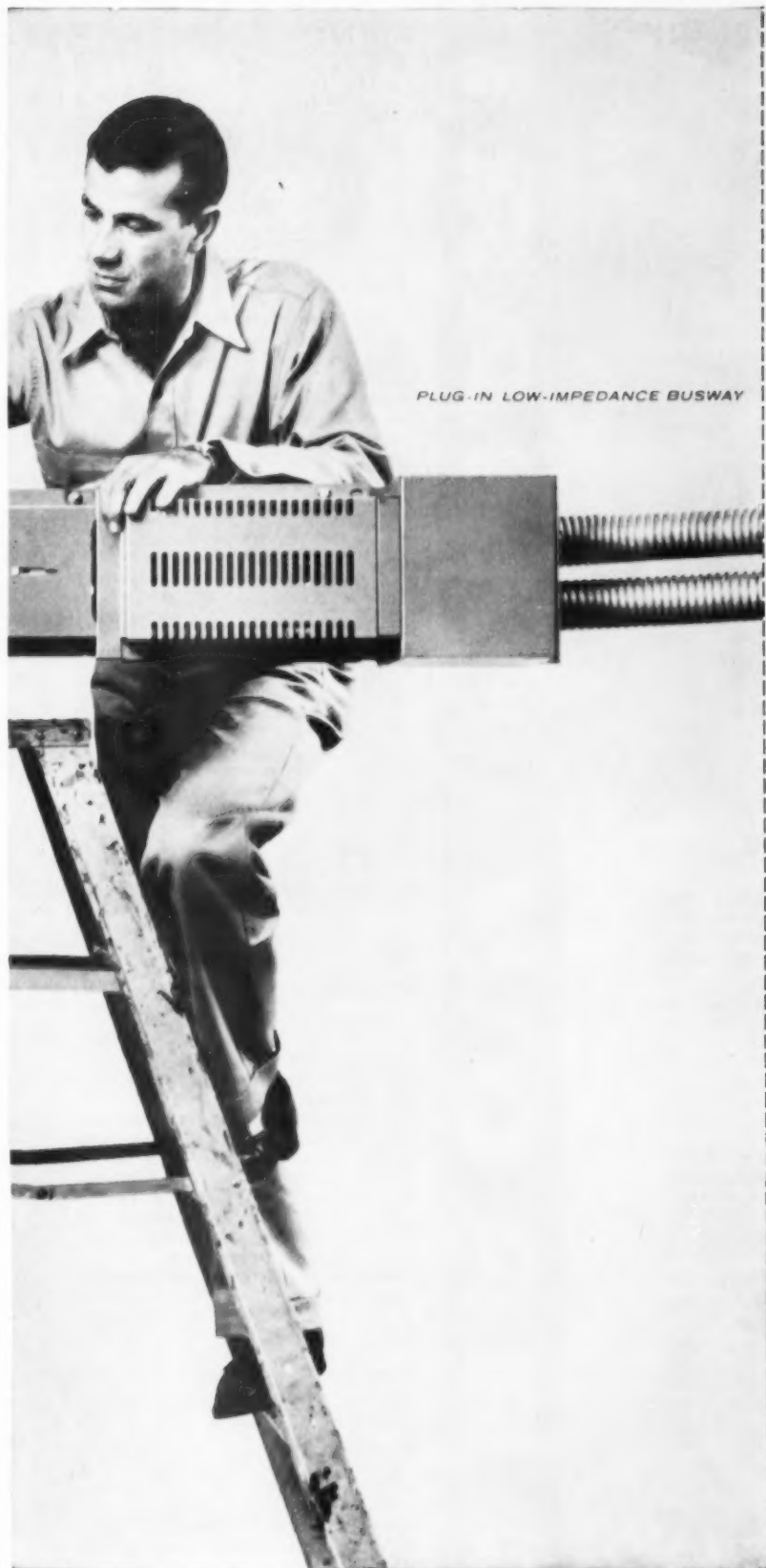
Uni-bus is the only completely safe busway because it is impossible for anyone to touch live parts through plug-in openings. Added protection is provided by the unique plug-in devices and triple-wrapped insulation on bus bars.

The features making these benefits possible are shown at right. Call your Westinghouse distributor today. Or write for booklet, B-7015, Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pa.

J-30239

YOU CAN BE **SURE**...IF IT'S

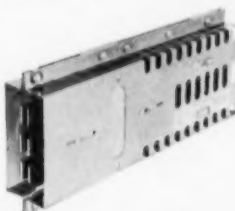
Westinghouse



PLUG-IN LOW-IMPEDANCE BUSWAY

Construction details of Uni-bus, new power distribution system

Many reasons make Uni-bus unique in the busway field. Three exclusive features are detailed here:



Safety slide . . . Interlocking slide keeps plug-in openings closed until plug-in device is fastened to busway. Device cannot be removed when slide is opened. System has 12 outlets per 10-foot length.



Flexible connector . . . One unit does the job normally requiring many special fittings in other busways. The connector consists of two attachment boxes joined with flexible conduit and cable.



Uni-bus plug . . . Here is convenience and safety in one plug-in system. When cover is open no live parts are exposed. Contacts are visible in open position for positive identification. Contacts interlock so circuit is not opened or closed on bus bars.

At left is an illustration showing why Uni-bus is your best power distribution buy.

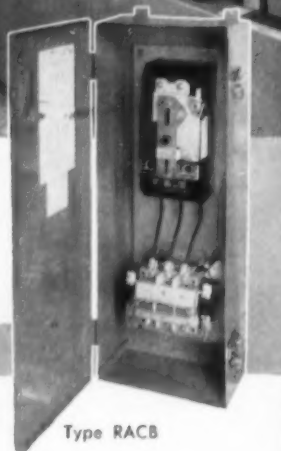
YOU CAN BE **SURE**...IF IT'S

Westinghouse



**YOU can count on
ARROW-HART for
ON-THE-JOB HELP**

*Arrow-Hart Type RACB Combination
Starters At The Connecticut By-Products
Company, Columbia, Connecticut*



Type RACB

PROBLEM: To provide the best method of one-point control for electrically operated production equipment in a new plant . . . and to answer perplexing installation wiring questions.

The Arrow-Hart Distributor, Beacon Light & Supply Company, Hartford, Conn., called for ARROW-HART SALES ENGINEERING SERVICE. THE NEAREST ARROW-HART SALES ENGINEER PROMPTLY WENT DIRECT TO THE JOB.

SOLUTION: The A-H Sales Engineer analyzed the requirements and recommended Arrow-Hart Type RACB Combination Starters to save space and assure easy, fast installation and economical operation. Type TRA Reduced Voltage Starters were used to protect against line disturbances.

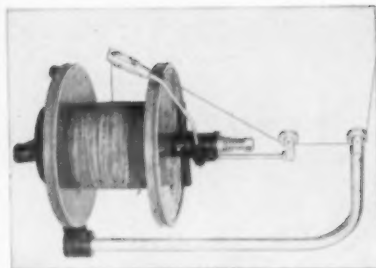
Equally effective on-the-job assistance is offered to all Arrow-Hart Distributors, Electrical Contractors and Plant Engineers confronted with perplexing problems. Simply write Dept. ECM, The Arrow-Hart & Hegeman Electric Company, 103 Hawthorn Street, Hartford 6, Connecticut, for complete information on ARROW-HART SALES ENGINEERING SERVICE.

ARROW AH HART

Quality since 1890

MOTOR CONTROLS • ENCLOSED SWITCHES
APPLIANCE SWITCHES • WIRING DEVICES

ARROW HART

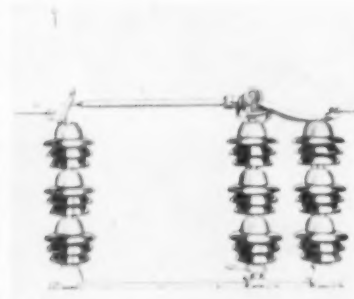


De-Reeler

(29)

Any type of magnet wire can be automatically removed from 12-in. diameter reels by using the new Model D-54 "Spinning De-Reeler". Unit is adaptable for floor or table use with any type winding machine or equipment. A steel overhead-arm and pulley lead the wire to winding machine or equipment. Unit is constructed of steel and bronze and finished in black enamel and cadmium plating. Overall height is 24½ in.; base, 11½ in. by 14½ in.

*Associated Production Company,
162 N. Clinton St., Chicago 6, Ill.*



Switches

(30)

New 115-kv vertical break switches, 600- and 1200-amp ratings, are available for outdoor, group-operation in horizontal, vertical or inverted mounting position. Designated Type PV2, they are recommended for sectionalizing, disconnecting, and bypassing applications. Switches meet all NEMA specifications. Features include, powerful blade action, permanent lubrication, high pressure contacts, and flexible interphase mechanism.

*Line Material Co., 700 W. Michigan
St., Milwaukee 1, Wis.*

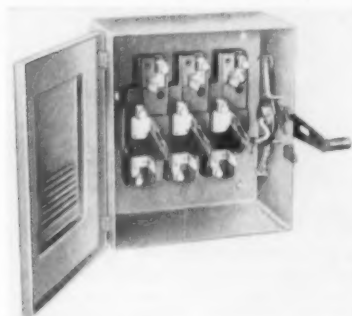
Time Switch

(31)

A new time switch provides for presetting a different program of operations each day of the week. Known as the Intermatic Series V21000, they are recommended for controlling heating systems, air conditioning systems, lights, fans, etc., on a weekly schedule. Seven sets of "On"- "Off" trippers are supplied

with each switch. Switches are housed in a steel case measuring 10 in. high by 4½ in. wide by 4 in. deep, with a black crackle, rustproof finish. Models are available for 20-amp, 125-volt or 15-amp, 250-volt, operation with various switching sequences. The series also feature: manual control with automatic reset, plated parts, easy-to-add trippers, and five convenient knockouts. Bulletin NR No. 226 is available.

International Register Co., 2624 W. Washington Blvd., Chicago 12, Ill.



Safety Switches (32)

A new line of industrial double throw safety switches for 240-600-volt ac or 250-volt dc service. Features include quick make-break mechanism; silver plated current-carrying parts; visible dual blade construction; individual porcelain block assemblies; and a minimum number of joints per pole to reduce heat generation and switch maintenance. Two-pole and 3-pole units are supplied as fusible or non-fusible equipment in NEMA No. 1 enclosures. Fusible units are supplied with patented high pressure fuse holders.

Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J.

Welding Control (33)

A new line of non-synchronous resistance welding control panels, which meet all NEMA performance standards and can be modified to meet JIC enclosure specifications. The line features unitized plug-in control units, hermetically-sealed relays and other long-life components, and standardized enclosures with swing-out frames. They combine the advantages of electronic control with the inherent benefits of hermetically-sealed relays. The basic unit size is 4 in. wide by 8½ in. high by 8 in. deep. Access doors are flush with the front and side of the enclosure and are provided with locking-type handles. Individual or combination control panels are suitable for wall, floor, or machine mounting. They may be stacked, mounted parallel, or mounted separately.

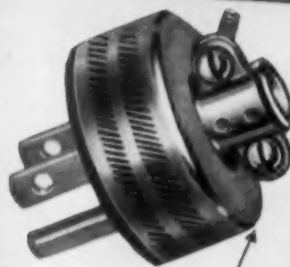
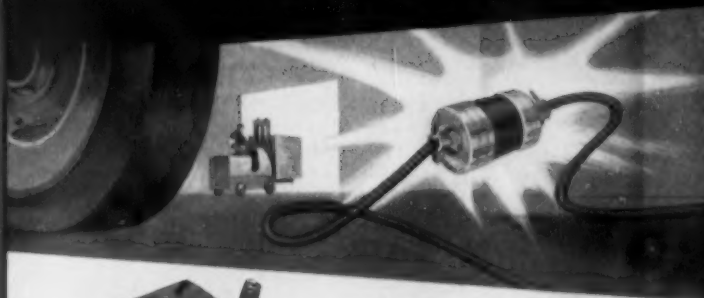
General Electric Company, Schenectady 5, N. Y.

ARROW



HART

**TOUGH ENOUGH
TO TAKE THIS...
and SAFE!**



No. 5286
15 Ampere, 125 Volt

ARMOR FOR TOUGHNESS

RUBBER RIM FOR SAFETY



No. 5686 15 Ampere, 250 Volt

ARROW-HART Armor-Over-Rubber GROUNDING CAPS

TOUGH ... Arrow-Hart 3-wire, 2-wire Armor-Over-Rubber Grounding Caps have been torture-tested ... run over by a truck and thrown against a wall without damage. And *there's no bakelite to crack and short circuit!*

SAFE ... Only Arrow-Hart Grounding Caps have the Rubber Rim that means greater insulation ... protection ... safety!

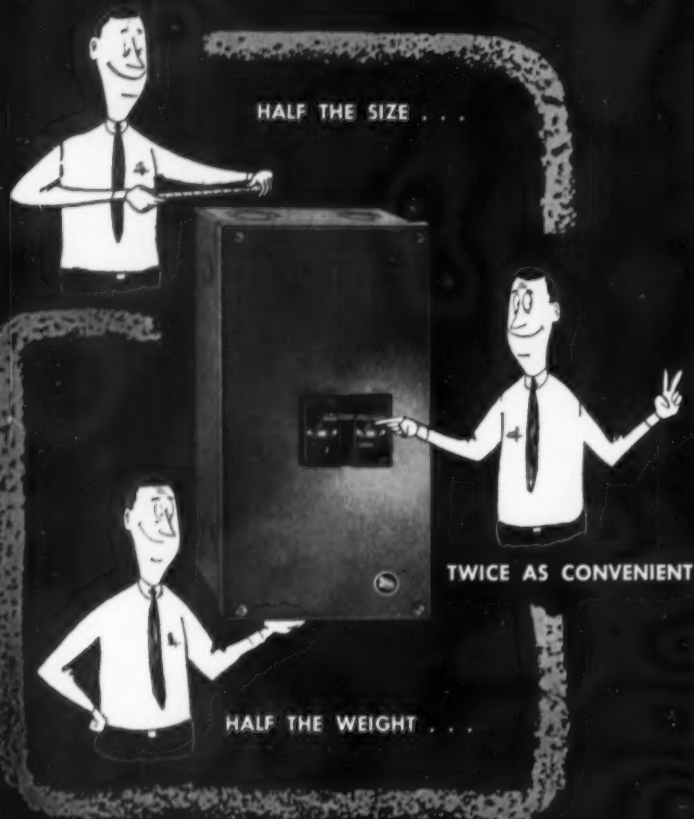
Write for complete information to The Arrow-Hart & Hegeman Electric Company, 103 Hawthorn Street, Hartford 6, Conn. Offices and sales engineers in principal cities.

ARROW AH HART
Quality since 1890

MOTOR CONTROLS • ENCLOSED SWITCHES
APPLIANCE SWITCHES • WIRING DEVICES

the best circuit breaker safety switch costs no more

You would expect to pay *much* more for this Heinemann
100 Ampere Safety Switch.



It's easier to install, more convenient to use. After trouble is cleared from the line, a flip of the handle restores service instantly. There's no hunting for fuses... no waiting to reset. Heinemann circuit breakers operate hydraulic-magnetically... permit safe use of the full capacity of your wiring at any temperature, without de-rating or the extra cost of larger switches. Inverse time delay allows necessary starting currents, prevents false-alarm tripping.

It's less than half the size and half the weight of comparably rated fused switches.

Yet, with all this extra value, the Heinemann Safety Switch costs no more. For descriptive literature, request Bulletin 1411.

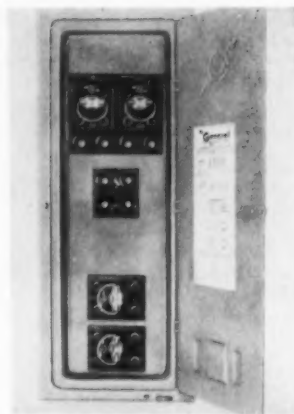
ORDER NOW

For 120/240 volts AC, 3 wire; 120 volts AC 2 wire with insulated groundable neutral.
Cat. No. H-9002-70 enclosure with 70 amp. circuit breakers.
Cat. No. H-9002-100 enclosure with 100 amp. circuit breakers.

HEINEMANN

ELECTRIC COMPANY

132 Plum Street, Trenton 2, N. J.



Service Entrance Equipment (34)

Two groups of fusible residential service entrance equipment have been redesigned and expanded. Both groups of devices are 100-amp multiple disconnect panels providing individual 220-volt service disconnects for three or four major appliances as well as a sufficient number of 110-volt plug fuse branches for lighting and small appliances circuits. Catalog Nos. 963-104, 963-106, 963-108, provide three 220-volt branch pullout switches plus a main lighting pullout controlling from 4 to 12 plug fuse circuits.

Catalog Nos. 9698, 96910 and 96912 provide four 220-volt branch switches plus a main lighting pullout switch controlling from 8 to 12 plug fuse circuits. Both groups are available in surface or flush enclosures and are provided with flush-ears for quick and positive flush mounting between studs. Data bulletins and catalog are available.

General Switch Co., 45 Roebling St., Brooklyn 11, N. Y.

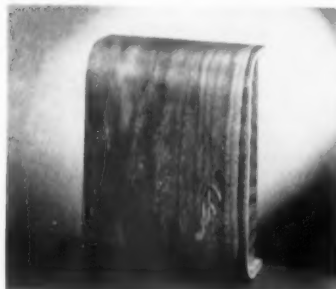


Lighting Fixture (35)

A new recessed dome lighting fixture which combines accent downlight and diffused indirect light. Called Quadrilite, the new incandescent unit suspends an apparently free-floating, star-shaped centerpiece in a contoured, 2-ft sq or 33-in. round dome. A horizontally positioned 200- or 300-watt bulb concealed within the star provides downlight through Coloured lens. At the same time, light is directed upward to dome and then reflected down for wide-area illumination. The star is a 30-in., one-piece form made of molded bakelite which is finished in a

light gray enamel. The domes, which are available either in round or square shapes, are finished in a baked white enamel. The round dome fits plaster and dry type ceilings while the square will fit suspended acoustical ceilings as well.

Lightolier, Inc., 346 Claremont Ave., Jersey City 5, N. J.



Door Chimes (36)

A new line of modern door chimes with satin finish natural wood cases, provide one note, two note and continuous signals. Each chime is enhanced by a musical decorative motif, formed of satin finish brass. Full utilization of the chime is provided by the exclusive Vibrechord movement so that two door signals and a continuous signal are available for paging and alarm systems for the modern home. Bulletin No. 10041 is available.

Edwards Company, Inc., 90 Connecticut Ave., Norwalk, Conn.

Connector (37)

A new 3-in. straight connector for attaching armored cable to standard knockout boxes. Using only a screwdriver, the connectors are installed after wiring is finished and cover is on the box. Harbot connectors are made of a special die cast aluminum alloy. They are available also in 45° and 90° models with many neck lengths for a wide range of applications. Approved by Underwriters Laboratories.

Unimatic Corp., R.F.D. 1, Caldwell, N. J.

Floodlight (38)

A new power beam floodlight producing 121,500 candlepower with a 500-watt rating. It weighs 13 lbs complete with 2000-hour power spot or flood, 25 ft detachable 3-conductor cord with plug and adapter, and protective lens with guard. Construction is rustproof, corrosion-proof, cast aluminum. Unit is available as portable, or truck mount with heavy mounting plate instead of tripod. Both types are fully adjustable in any direction. Bulletin No. 148 is available.

Stonco Electric Products Co., Kenilworth, N. J.

The stoutest pipe vise ... with built-in folding legs and tray

RIDGID

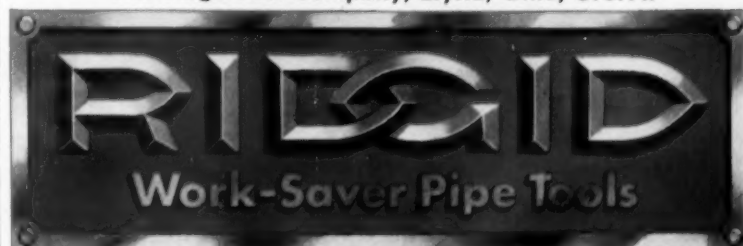
Tristand Pipe Vise

Extra easy to fold up, carry
and set up ... Extra strong,
extra rigid in use

Most service and durability for your money! Integral legs and tray mean quick easy fold-up for carrying and set-up for work—provide solid stance, greater strength. Vise base is roomy, has ceiling brace screw, conduit benders, slots for tools. Special LonGrip jaws grip tight without chewing up conduit. Save work—see it, try it, buy it at your Supply House.

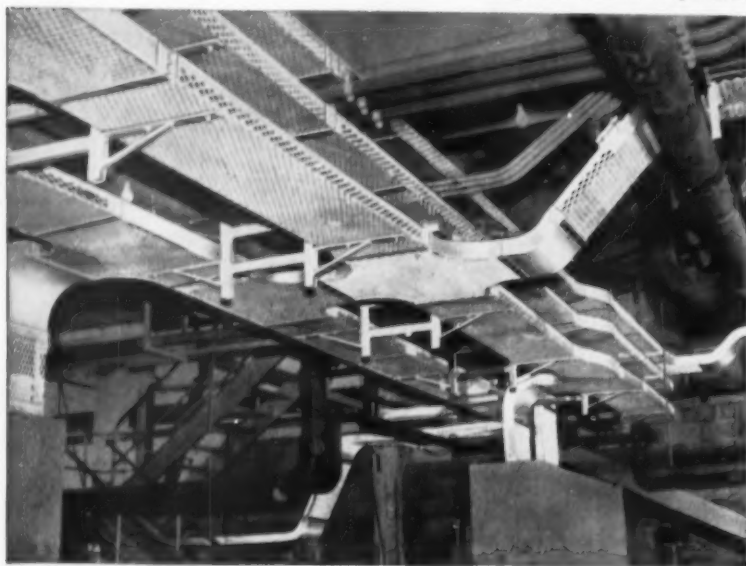
RIDGID
Tristand
Pipe Vise,
yoke model.
Chain model
also available.

The Ridge Tool Company, Elyria, Ohio, U. S. A.



YOU CAN SIMPLIFY CABLE INSTALLATIONS with COPE CABLE TROUGH

Humboldt Bay Steam Plant Pacific Gas and Electric Company
Engineers: Bechtel Corporation



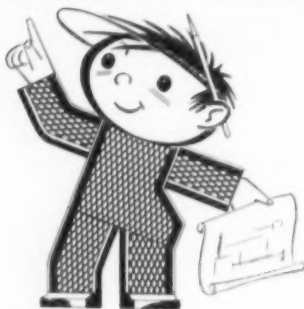
Contractors and engineers everywhere are fast realizing that more time—more costs—are saved when Cope Cable Trough is specified.

Cope Cable Trough goes up faster

Cope Cable Trough simplifies designs

Cope Cable Trough saves space

Specify Cope Cable Trough on your next job. You'll be amazed at how simple it is to install.



Tommy Cope says:

"Every minute you save on installation time increases your profit on the job."

Our engineers are ready to work with you. Write us today for full details on Cope Cable Supporting Systems.

T. J. COPE, INC.

COLLEGEVILLE 5, PENNSYLVANIA



Lighting System (39)

A new centralized emergency lighting system that constantly supervises itself has been tested and approved by Underwriters Laboratories. It is designed for use in public and private buildings. The system not only reports, by flashing lights and buzzers, any fault to the system but sounds an alarm when an emergency lamp is removed from its socket. Emergency lights go on the instant regular power fails and go off when power is restored. The special 32-volt battery is automatically recharged and kept at full capacity by a constant trickle of charging current. The system has been especially designed for new hospitals, schools, office and industrial buildings.

Standard Electric Time Co., Springfield 2, Mass.

Lighting Fixture Hanger (40)

A new lighting fixture hanger called Swiv-L-Drop. It assures perfect alignment of fixture pendant automatically, regardless of angle of outlet box or ceiling slope, up to 45°, and facilitates installation and lining up of continuous or broken rows of lighting fixtures. Fixtures can be removed easily for cleaning, repair or replacement. With the Sway Adaptor, pendants can be adjusted up or down and when used with Swiv-L-Drop, provides protection against all shock or motion due to earthquakes, concussions, etc. Literature is available.

Myers Electric Products Inc., 3019 S. Vail Ave., Montebello, Calif.

Pipe Threader (41)

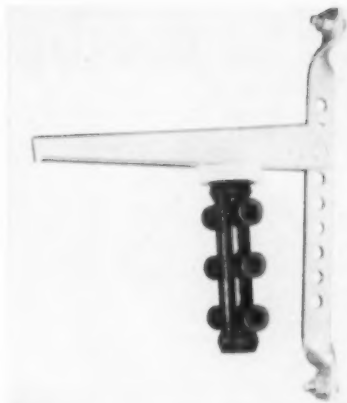
The 4PJ 2½-in. to 4-in. geared pipe threader is now equipped with automatic drive kick-out that makes it jamproof. After each standard length thread is cut, the drive pinion on the 4PJ kicks out automatically and prevents jamming. Gears are all fully enclosed and there are no bushings.

Ridge Tool Company, Elyria, Ohio

Time Switch (42)

A redesigned and improved 3-pole time switch, Model 1963, for controlling 3-phase power and lighting loads. Four dial styles are available—regular 24-hour dial, skip-a-day dial, astronomic dial, and 7-day dial, in enclosures best suited for the particular installation. It can be used to control a 1½ hp 3-phase motor directly. Electric heater loads may be controlled up to full rated capacity as well, a total of 7500 watts, for each pole of the 1963 is rated at 25 amps. Ilco lugs take up to No. 8 wire without bending.

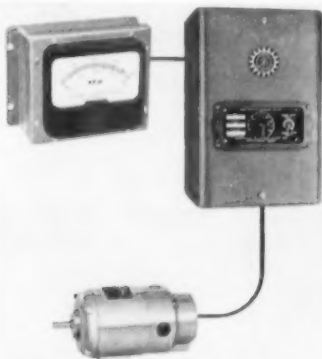
Tork Clock Co., Inc., Mt. Vernon, N. Y.



Rack (43)

A new rack design for support of moles. It was designed with the cooperation of Burndy Engineering Co., manufacturers of the Burndy Mole, which is used frequently with underground distribution lines. The rack will support both sizes of moles—1,500-amp and 2,000-amp, and if necessary, 3-phase circuits. A standard wall mounted rack has a horizontal arm with two types of porcelain supports. The circular type support is used where the mole is to be supported vertically. The Burndy Mole can be positioned horizontally on the arm, as well as vertically. A semi-circular type of support is used for this horizontal position.

T. J. Cope, Inc., Collegeville, Pa.



Relay (44)

The MEK-2060 speed sensor relay allows the use of speed as a controlling quantity. Processing or testing cycles can be automatically started after a pre-set speed has been reached. It can also be used as an under speed or over speed limit. Control unit is available in either open or enclosed, NEMA Type 1, forms. Other enclosures such as NEMA Type 12 are available. The tachometer generator is of totally enclosed, non-ventilated construction and can be remotely mounted from the control unit.

Machinery Electrification, Inc., 35 Hudson St., Northboro, Mass.

CADWELD.
solves
TOUGH
connector
problem

of connecting two —
350 MCM copper cables to three —
250 MCM flexible copper braids. The braids
in turn are connected to 1-1/4" nichrome rods.
CADWELD'S versatility of design and outstanding
electrical properties solved the problem.

**YOUR electrical connection
problem due to:**

1. Conductor construction
2. Type of conductor material
3. Overload and surge currents
4. Corrosive conditions
5. High ambient temperature

CAN BE SOLVED WITH . . .

CADWELD®

Erico Products, Inc.

2070 E. 61st Place Cleveland 3, Ohio

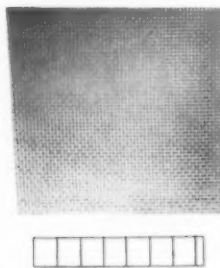
IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario

You'll put your client in the best

These represent just a few of the many Corning glasses specially designed for engineered lighting applications.



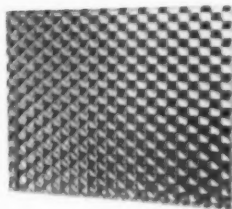
For high efficiency, uniform, general lighting with incandescent lamps, Corning PYREX Concave Lenslites are recommended. Made of a PYREX brand glass, they provide freedom from breakage even in outdoor service with high wattage bulbs. Designed on the Fresnel principle, they give exceptionally even light distribution over a wide area.



Corning Fota-Lite combines the easy-to-clean, easy-to-handle advantage of a smooth, static-free sheet of glass with the control that louvers afford. The effect is of crystal-clear cells separated by white opal louvers. Available with vertical louver pattern for 45° cutoff, and with 30° slanted louvers for offset beam lighting.

SEE OUR CATALOG
IN SWEET'S
ARCHITECTURAL
FILE
OR WRITE FOR COPY

possible light with Engineered Lighting



For uniform, efficient light distribution with low surface brightness, specify Corning Pattern No. 70 Low-Brightness Lens Panels. Optically correct 6-sided pyramids distribute the light in all directions.



For diffused light in the working area with reduced brightness contrast between ceiling and fixture, specify Corning Curved Alba-Lite Panels. Made of a light opal glass the curved panels afford complete diffusion, excellent brightness control free of color distortion, with a part of the light delivered above the horizontal for reduction of contrast in the ceiling area adjacent to the fixture.



Your client's offices, his people, his goods . . . all are in their best possible light . . . when you utilize the principles of engineered lighting in designing his lighting installations.

Engineered lighting is *on-the-job* lighting. It means light that is adapted, through Corning's optically engineered glassware, to the illumination needs of a specific job. It is the key to better working efficiency, comfortable seeing, increased sales. It does the job with light that glass can do best.

As the transmitting and control medium, glass determines the intensity of the light, its direction, its color-revealing fidelity, its comfort. As a part of the lighting fixture, glass also determines the fixture's attractiveness, its ability to fit into the decorative scheme . . . and its ease of maintenance and cleaning.

Corning's laboratories are continually at work to develop more applications for lighting glassware, new glasses, and new methods of controlling light with glass. The experience gained here is available to you at any time—at any stage of an installation—through Corning's staff of lighting consultants.

Send, now, for your copy of Corning's new "Application Guide for Commercial Lighting Glassware." It will help you in selecting the lighting glassware that meets your specific application requirements for offices, schools, banks, public buildings, stores, displays, hospitals. Write, wire, or phone Lighting Sales Department, Corning Glass Works, Corning, New York.

CORNING GLASS WORKS

Lighting Sales Dept.

65-2 Crystal St., Corning, N. Y.

Please send me a copy of your new "Application Guide"

Name.....

Address.....

Position.....

City.....



CORNING GLASS WORKS, CORNING, N. Y.

65-2 Crystal Street

Corning means research in Glass

full voltage...non-relay...touch action

Rodale Touchette®

lowest cost
for
touch-action
convenience



touch... It's lit touch... It's off

UL LISTED

Your customers will be delighted with the modern, convenient performance of Touchette... it's real economy. That's why Touchette is so right to specify for either new construction or rewiring jobs.

To your customer, Touchette means unmatched ease in turning lights and appliances on and off... just a light touch of hand, elbow or shoulder. No groping for toggle, no knob to turn.

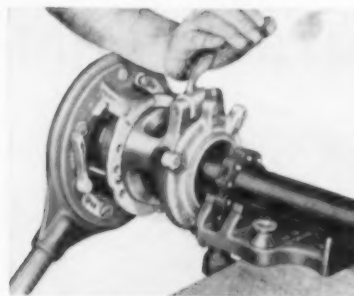
For you, Touchette means economical installation, time-wise... and money-wise. Because Touchette operates on full line voltage, there is no need for special wiring, relays or transformers to increase installation time and cost. And Touchette fits standard outlet boxes and wall plates... allows a choice of any plate in new construction, eliminates discarding favorite plates in rewiring jobs. Rated 15A-120-277V, Touchette is available with brown or ivory button in single pole, double pole, 3-way and 4-way models.

See Touchette in LIVING FOR YOUNG HOMEMAKERS, HOUSE & GARDEN, HOUSE BEAUTIFUL, HOME MODERNIZING... your customers will!

Get the details on Touchette now. Contact your electrical wholesaler for complete information and prices... or write:

Rodale

MANUFACTURING COMPANY, INC.
Dept. E2 EMMAUS, PENNA.



Workholder (45)

A new True-Centering workholder has been announced as an improvement on the Ridgid 65R pipe threader. The 65R with the TC workholder assures a perfect thread every time because all three workholder jaws close at one time. User pre-sets the workholder cam plate to desired pipe size, which adjusts all three jaws in a single mechanical action. When threader is on the pipe, workholder jaws tighten as this 3-jaw action is continued by pump of palm of operator's hand on forged cam lever.

Ridge Tool Company, Elyria, Ohio

Magnetic Relay (46)

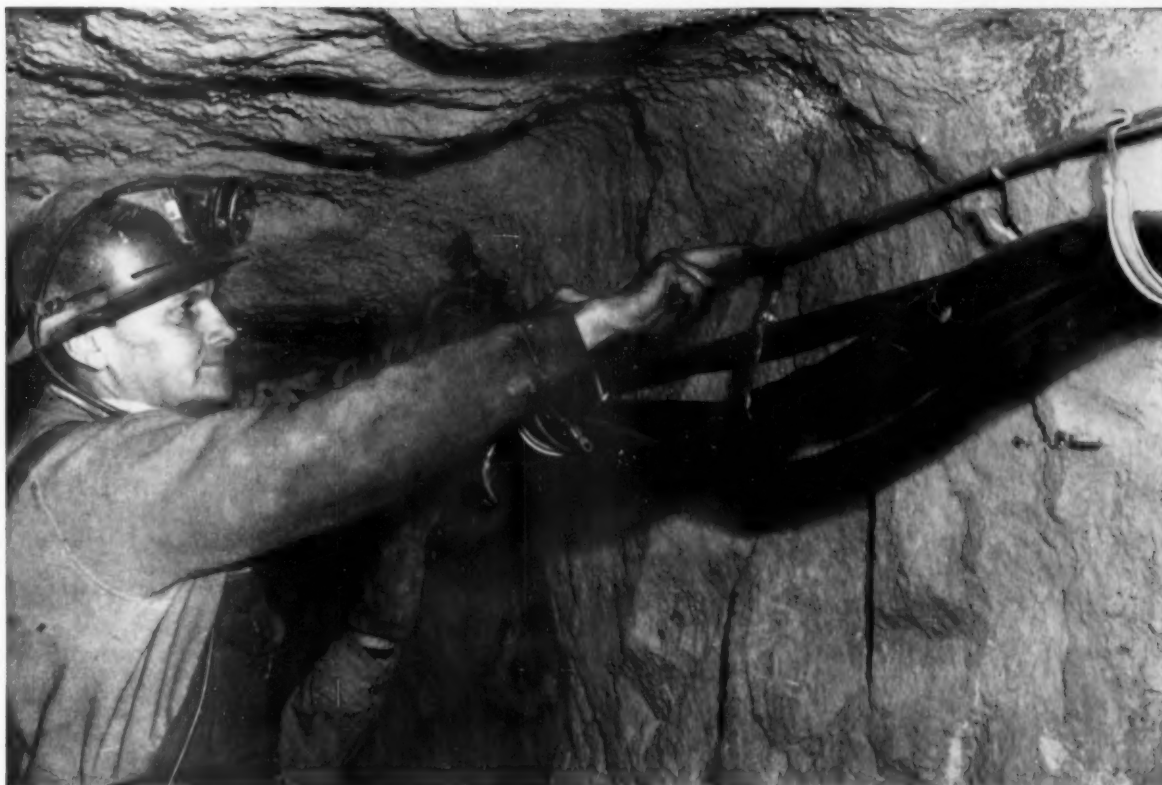
A 20-amp magnetic relay suitable for all types of fractional and integral hp motors used in every type of commercial and industrial application. It can be used with 80% of all residential central air conditioning units and commercial and industrial heating element loads for such applications as unit heaters, deep-fat fryers and ovens. It is also suitable for handling solenoid valve and other control circuit relay loads for heavy motors and for starting and stopping small motors for power tools, etc.

Arrow-Hart & Hegeman Electric Co., Hartford 6, Conn.

Motors (47)

A new line of totally-enclosed air-over ac motors produce varying hp according to the application of varying air velocities. This effect is accomplished by the cooling effect of the air flow over the motor frame created by the fan or blower it powers. Features include cast iron ribbed frame construction, oversized double-shielded ball bearings, and metermatic lubrication with automatic grease relief; heavy Formvar nylon coated magnet wire is used for coils, with six coats of special insulating varnish. Motors are available in the new NEMA frame sizes from $\frac{1}{2}$ through 30 hp and may be operated on 208-volt network systems. Normally supplied in non-ventilated construction, explosion-proof Class I, Group D and Class II, Groups E, F and G enclosures are also available.

Reliance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland 10, Ohio



Workmen is hanging shielding ground wires. 22,000 ft. of three neoprene-jacketed, single conductor cables were hung in a total of 12 working days. Circuit was designed to carry 3,500 kw of power to the mine operation

with an automatic regulation of 3% at 90% PF lagging. This type installation offered the advantages of single metering and a broadened load base.

At Idarado Mining Co., Telluride, Colorado

NEOPRENE jacketing protects 13 miles of underground 250 MCM 13,000 V cable



Preparation of lead cable joint. Joints were made by connecting the conductor with a sleeve-type compression connector installed with a hydraulic compression tool. Outer jacket of joint was made with neoprene tape (shown in red).

To transmit power at 12,470 phase to phase volts, the Telluride Mines portion of the Idarado Mining Co. used 13 miles of neoprene-jacketed cable underground. Their choice of neoprene jacketing was the best possible assurance of dependable cable service.

Neoprene has exceptional durability. It resists soil acids and abrasion underground; sunlight and weathering above ground; oil, grease, chemicals and ozone anywhere. Long-lasting protection for cables is assured. And because neoprene is flexible, cable installation is easier.

Next time you order, ask for cable that keeps maintenance and replacement costs to a minimum—cable jacketed with neoprene. It's available in single- and multiple-conductor types to meet your requirements.

NEOPRENE

The rubber made by Du Pont since 1932



BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

FREE! THE NEOPRENE NOTEBOOK. Every issue contains interesting stories about products made with neoprene. Actual case histories give you the facts about neoprene's longer service life. Clip coupon to get on the mailing list.

E. I. du Pont de Nemours & Co. (Inc.),
Elastomer Chemicals Div. EC-2
Wilmington 38, Delaware

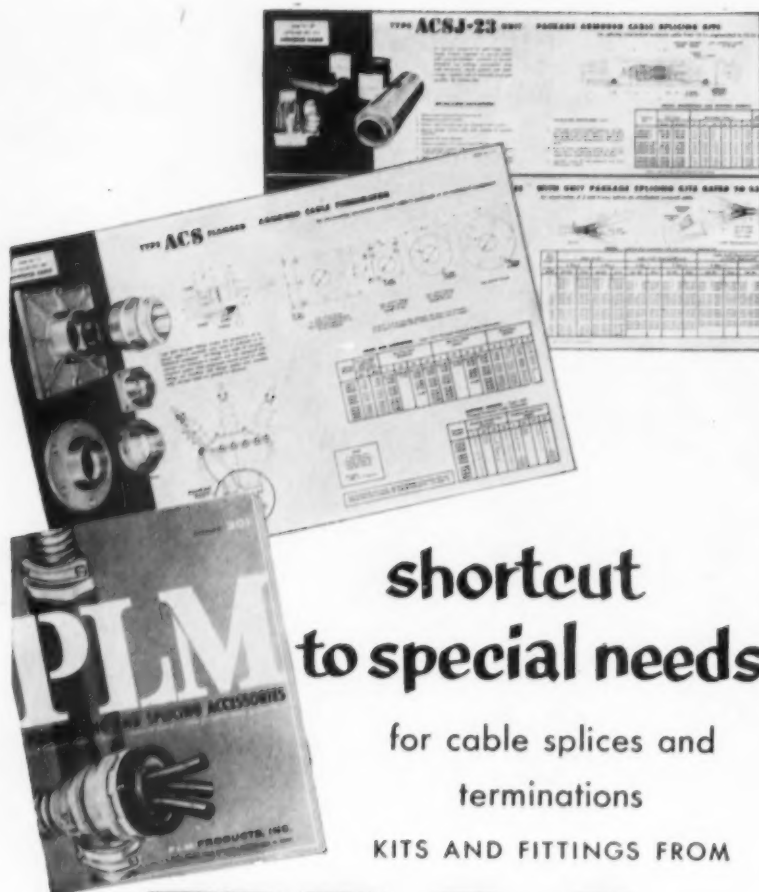
Name _____ Position _____

Firm _____

Address _____

City _____ State _____





shortcut to special needs

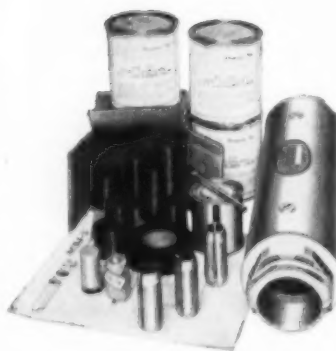
for cable splices and
terminations

KITS AND FITTINGS FROM

PLM

● Faced with needs for special splices — in or to armored cable, non-metallic sheathed cable, lead-covered cable? In a fix for terminating fittings for special mountings?

You'll find help — *fast* — both on standard and special requirements, from PLM. Hundreds of stock sizes and ratings of terminating fittings through 15 kv, and splicing and terminating kits through 23 kv, are listed in PLM Catalog 301. Special adaptations can be supplied on short shipping schedules. Put your problems up to PLM today . . . write for catalog or quotations on your needs.



PLM Unit Package Kits simplify cable installation . . . provide complete materials for correctly designed splice or termination, in one package.

PLM PRODUCTS, INC. • 3875 West 150th Street • Cleveland 11, Ohio
WIRE AND CABLE FITTINGS AND ACCESSORIES

Motors

(48)

New re-rated motors, Series 254U, conform with the new NEMA requirements. Features are straight-through, dual-sweep ventilation; Mylar, laminated to rag paper, used as slot cell insulation; removable cover plates on each end-head; numbers are permanently-impregnated into sub-surface of insulation; full-height end-head protection; factory-installed end head screens.

Robbins & Myers, Inc., Springfield, Ohio

Electronic Control

(49)

The MEK-3030 electronic proximity control detects the presence of an insulator or conductor at the detecting point without making contact with the surface. It can be used as a limit switch; a level control of such materials as soap, coil, oil, etc.; an interface control between dissimilar fluids. Some of the features are voltage regulation, plug-in relay, visible contacts. Input voltage is 115 volts, 60 cycles, line consumption 25 va relay capacity 5 amps, 114 volts, contact available SPDT. It operates on a principle of high frequency energy. The presence of the material close to the detecting element is reflected into the electronic circuit as an increase in loading. This loading is detected and amplified to operate the relay.

Machinery Electrification, Inc., 35 Hudson St., Northboro, Mass.

Product Briefs

(50) Pneumatic impact action for high-speed drilling in concrete, brick and masonry can now be obtained with any 1-in. electric drill by means of a rotary impact masonry drill attachment 6 in. long by 1½-in. diameter developed by the Power Tools Corp., Cleveland, Ohio. . . . (51) A new improved machine screw anchor, called Rawl Calk-in, has been announced by the Rawlplug Company, New Rochelle, N. Y. . . . (52) Single-pole Tork light and power and program time switches are now available with 440-volt motors for use in installations requiring that voltage. They are manufactured by Tork Time Controls, Inc., Mt. Vernon, N. Y.

(53) A new kind of cabin has been developed for pickup trucks, which allows protection from weather of a closed truck when needed, or large capacity of an open pickup when odd-shaped loads are carried. It is called Compac, and is available from Supreme Metal Products Co., Downey, Calif. . . . (54) A new 3-in. burnisher with a plastic "slim-grip" handle, for use where relay contacts are almost completely hidden and hard to reach, has been announced as an accessory for its pen-type contact burnisher by the Adre Co., Hales Corners, Wis.

HERE'S WHY

CERTIFIED  BALLASTS

ENJOY A PREFERENCE OF NEARLY

2 TO 1

In 1955, nearly 2 out of 3 HPF ballasts were CERTIFIED CBM BALLASTS.

There is just one reason for this preference:

CERTIFIED CBM BALLASTS assure more satisfactory and economical fluorescent lighting.

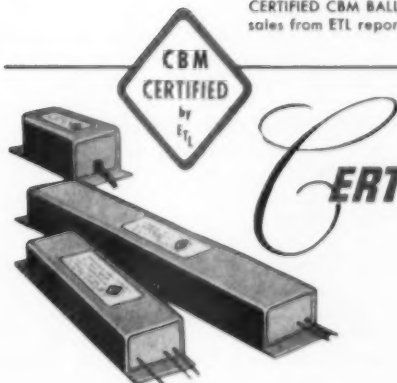
Built to exacting specifications that provide the precise electrical needs of fluorescent lamps, and periodically checked by Electrical Testing Laboratories, Inc., CERTIFIED CBM BALLASTS are your assurance of:

**RATED LIGHT OUTPUT • RATED LAMP LIFE
LONG BALLAST LIFE • TROUBLE-FREE OPERATION
FREEDOM FROM NOISE**

... all contributing to better lighting, lower maintenance cost and more economical fluorescent operation.

*Total ballast sales from U. S. Dept. of Commerce. CERTIFIED CBM BALLAST sales from ETL reports.

Send for free booklet, "Why It Pays to Use CERTIFIED CBM BALLASTS in Fluorescent Lighting Fixtures".

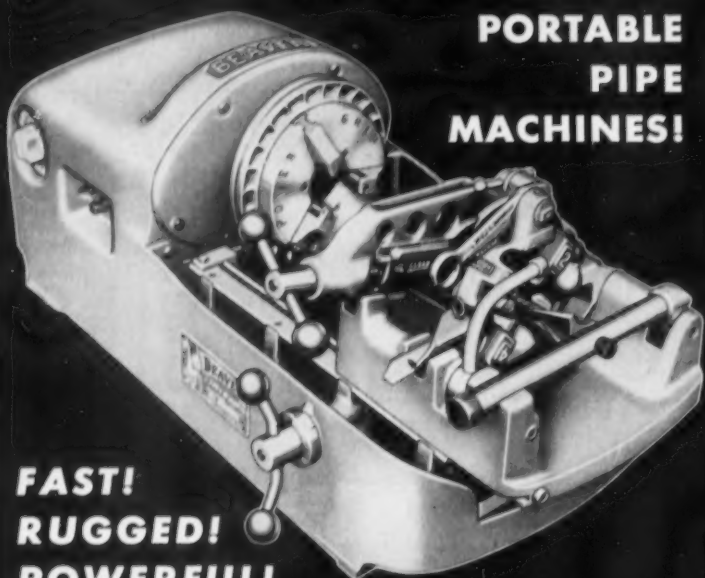


CERTIFIED BALLAST MANUFACTURERS

2116 KEITH BUILDING • CLEVELAND 15, OHIO

Seven of the country's leading manufacturers of ballasts make CERTIFIED CBM BALLASTS. Participation in CBM is open to any manufacturer who wishes to qualify.

THE LAST WORD IN PORTABLE PIPE MACHINES!



**FAST!
RUGGED!
POWERFUL!
LIGHT—ONLY 170 LBS!**

The ALL NEW BEAVER Speed-O-Matic

PORTABLE PIPE AND BOLT MACHINE

- 50% more speed and power from faster, all new motor! Motor and switch fully protected.
- New "CLEAR-VU," self-centering wheel and roller cut-off; die heads with high-speed steel dies; and reamer, all pivot mounted! Ideal for "make-up."
- Quick-acting Power Grip Wrenchless Chuck—forward or reverse!
- Threads $\frac{1}{8}$ " to 2" pipe (up to 12" with drive shaft) $\frac{1}{4}$ " to 2" bolts.
- Instant and accurate easy-setting spool-type pipe support eliminates double chucking.
- Lubricated for life!
- Oiling tube directs oil right to threading dies! Shuts off automatically.
- Lathe-type thread length indicator.



Can't tell it all here!
Send for New Beaver
Quick Reference
Catalog! Get the
latest facts on
**ALL new Beaver
machines!**



CATALOGS and BULLETINS

(55) **DESK LAMPS**, fluorescent and incandescent, of swivel design in variety of models for residential, commercial and institutional use. Swing-O-Lite Inc.

(56) **PLATING RECTIFIER** of germanium featuring unique air cooling system design, finger-tip remote control and automatic voltage stabilization in ratings from 6 to 24 volts and 750 to 12,000 amps is treated in large fold-out bulletin GED 2934. General Electric Co.

(57) **PACKAGED SUBSTATIONS**. Six distribution substation designs for rural, urban or industrial applications are illustrated in 28-page Bulletin SB1. Typical bills of material for each design are shown for various operating voltages; basic information on structural strength and foundation plans is included. Line Material Co.

(58) **RUST PREVENTION**—a comprehensive easy-to-understand 32-page full-color manual for determining quickly and accurately the specific coatings needed to protect practically any rustable metal surface. Form No. 256. Rust-Oleum Corp.

(59) **LIGHTING FIXTURES**, incandescent and fluorescent, for industrial and commercial requirements are covered in new 400-page catalog. Featured are new slim dimension latchless fluorescent troffers and incandescent fixtures in a full range of colors for accent lighting. Ruby-Philite Corp.

(60) **CARBON BRUSHES** for electric tool motors. New 34-page catalog describing 250 brushes is organized for ease of brush selection for replacement in hammers, drills, saws, sanders, grinders, etc. Catalog No. 69-C. Ohio Carbon Co.

(61) **DISTRIBUTION TRANSFORMERS**—their dimensions, weights, performance data and list prices—in new 56-page book. Pennsylvania Transformer Co.

(62) **SOLDERING TIPS** in 40 stock sizes and shapes plus many special styles are illustrated in Catalog No. 144 together with tip diameter and length, style of tip point, and size of tip point. Hexacon Electric Co.

You Name It!

Whatever type of
Wire Connector you prefer
you get "The Best in the House"*
when you ask for



The solderless, tapeless wire connectors that
changed the wiring habits of the industry!
Now better than ever.

Just screw them on—like a nut on a bolt. In one quick operation they twist, thread, grip with spring tension and insulate. "Wire-Nut" pig-tail splices are pull-proof, shake-proof, good for a lifetime. New knurling of long-skirted, high dielectric shell makes 'em even easier to use.



The stronger crimp connector that diaper-wraps the splice in perfect, pre-fabricated insulation. Easy as 1-2-3 to make a permanent, positive joint . . . strip wire — insert ends in sleeve — crimp and cut off excess wire — slip on "Wrap-Cap". "Wrap-Cap" fits snugly all around and between wires — gives double protection over wire ends — resists ageing and deterioration.



*Patented, No. RE25640 and other patents pending



With a pocket-full of IDEAL Set-Screw Connectors and a screwdriver, you're "in business". Simply insert wire ends in the brass sleeve, tighten set-screw and screw on the precision-molded phenolic shell. Allows visual inspection of joints — makes circuit changes easy, re-using same connectors. Compact shape is fine for crowded boxes and fittings. Extra-long skirt prevents shorts. Shell has extremely high dielectric strength.

IDEAL

**"WIRE-NUTS", SET-SCREW
AND CRIMP CONNECTORS**

are available in sizes for all common wire combinations. Connector sizes are listed by Underwriters' Laboratories, Inc., as pressure-cable connectors for general use (600 V.) in branch circuit and fixture wiring.

SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS
In Canada: Irving Smith, Ltd., Montreal

IDEAL INDUSTRIES, Inc.

1041-B Park Avenue, Sycamore, Ill.

Please send full catalog data on

☐ IDEAL "WIRE-NUTS" ☐ IDEAL CRIMP CONNECTORS

☐ IDEAL SET-SCREW CONNECTORS

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



TRUCO Drills 2½" Holes in 90 Seconds on 8,400 Outlet Electrical Project

JOB: Penetrate 3½" concrete cap over cellular steel flooring for 2½" dia. electrical outlets at Ford Motor Company's new Administration Building. 8,400 holes required to bring in electrical, telephone and inter-com wiring for offices.

CONTRACTOR: Harlan Electric Company, Detroit

TOOLS: Truco Diamond Drilling Machine equipped with 750 RPM Motor and 2½" O. D. Truco Diamond Drill Bits. (Machine was also used for horizontal drilling.)

DESCRIPTION: Spotting crews located outlets and cut the rubber floor tile with a circular saw. Portable rubber-tired Truco Diamond Drilling Machine then drilled through concrete in 90 seconds per hole. Complete cores were lifted out leaving smooth, perfect holes, requiring no patching or finishing. Finished floor undamaged by drilling operation.

Picture shows Truco vacuum water pick-up removing cuttings and coolant water as Truco unit is drilling. Because Truco is dust-free and relatively quiet, drilling was done in occupied sections of the building without disturbing tenants.

Job superintendent reports, "No other equipment could do the job the diamond drill performed on this project. It shaved weeks off our schedule and reduced our drilling costs materially."

**INTERNATIONAL HEATING &
AIR-CONDITIONING
EXPOSITION**

International Amphitheatre, Chicago
FEB. 25-MAR. 1, 1957

WRITE FOR NAME OF NEAREST DISTRIBUTOR

**WHEEL TRUEING
TOOL COMPANY**

95-3200 W. Davison Ave., Detroit 38, Michigan

(63) **LINEMEN'S TOOLS** and equipment catalog includes detailed information on complete line of pliers. Dimensions of each part of every plier. Mathias Klein & Sons.

(64) **PACKAGE SUBSTATIONS** for rural use are described and illustrated in 32-page Bulletin GEA-5276C. Arrangements included are simple radial with one feeder, simple radial with one to four feeders, radial with looping high-voltage circuit, and high-voltage selective for two incoming lines. General Electric Co.

(65) **ELECTRICAL INSULATION** for repair and maintenance of motors, generators and electrical or electronic equipment. Insulation Manufacturers Corp.

(66) **LIFT TRUCKS**—how to operate them. A 24-page booklet using a 2-color cartoon technique gives complete information for beginning or experienced operator on lift truck operation, preventive maintenance, safety and basic materials handling. Form 1214. Hyster Co.

(67) **CONNECTORS** for live line hot taps, transformer ground and stud connectors, terminals for cable to flat bar, parallel clamps, ground connectors for cable to pipe, and clamp terminals—illustrated with photographs and drawings in new "Connector Reference File". Burndy Corp.

(68) **LIGHTING FIXTURE** design and placement trends are pointed up by illustrated folder on new high-intensity illumination installed in the Connecticut Light and Power Co. Norwalk offices. Fullerton Mfg. Corp.

(69) **AVA CABLE** application and design data is provided in new 28-page catalog. Such information as circuit length for 1-volt drop, capacity and regulation comparisons, and economic and physical comparisons is tabulated. Rockbestos Products Corp.

(70) **EXCITATION SYSTEMS** for turbo-generators are compared in 8-page leaflet, listing principal component parts used in each of four different systems. Allis-Chalmers Mfg. Co.

(71) **LIGHTING EQUIPMENT** described in new 12-page booklet includes luminous ceilings, modular lighting equipment, pendant mounted fixtures, and the new high frequency lighting system. Wakefield Co.

Brand New Idea

in STANDARD-DUTY STATIONS



THE CONTACT MECHANISM IS IN THE COVER!

THESE ARE THE WIRING TERMINALS!

EASIER TO WIRE!

No skinned knuckles
No cramped wiring space

Here's an entirely new idea in push button stations—a wrap-around cover—with the contact mechanism part of the cover. Removing the cover exposes the terminals for instant and easy wiring. Strong, spring type, silver plated contacts connect the push button assembly in the cover with the terminals in the base.

Matching ribs in the cover and notches in the terminal blocks assure that the wiring connections are always correctly made. A bakelite shield

protects the contact mechanism and prevents careless wiring from interfering with the contact operation. Concentric knockouts are provided in both top and bottom of the heavy metal base.

You will want to know about this new standard-duty station because—it is good looking—it takes less time to install—it was designed for the convenience of the installation engineer.

Let us show you a sample of this "brand new idea" in standard-duty stations!



ALLEN-BRADLEY

QUALITY

MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ontario

Bulletin 800 standard-duty push button stations can be supplied with one, two, or three buttons, or as a selector switch. Also available with pilot light. Furnished only in NEMA Type 1 enclosures.



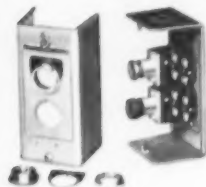
2-57-M

Also... **NEW HEAVY-DUTY PUSH BUTTONS**

BULLETIN 800



NEW FLEXIBILITY!



You can assemble any special heavy-duty station from a small stock of standard push button, selector switch, and pilot light components. There is no need to wait for long delivery of your special stations.

Stations can be arranged for either vertical or horizontal mounting. Name plates can be rotated to any position, replaced with any standard marking, or removed entirely.

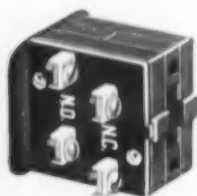


NEW ENCLOSURES!

Each button, selector switch, or pilot light is a self-contained unit which can be mounted in attractive new enclosures. Standard enclosures accommodate up to eight units, but enclosures can be furnished for larger numbers.



NEW CONTACT BLOCK!



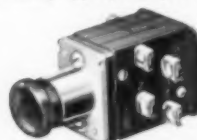
Above: View of contact block, showing terminals for normally open and normally closed contacts. Right: Contact block, with cover removed, showing stationary silver alloy contacts and pushrod carrying the moving contacts.

Bulletin 800 heavy-duty push buttons have the same molded contact blocks that have proved so dependable in Bulletin 800T oiltight push buttons, although they are not themselves oiltight. And all of them are equipped with double break, silver alloy contacts.

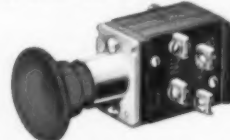


NEW OPERATORS!

Operators, which mount on the contact block, are available in many types, and push buttons come in various colors.



Type AK2B flush head START button



Type DK6A mushroom head button



Type PK16 pilot light with transformer



Type EK11B cylinder lock unit

2-57-M



ALLEN-BRADLEY

QUALITY

MOTOR CONTROL

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada—Allen-Bradley Canada Ltd., Galt, Ontario

Reader's Quiz

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay \$5.00.

Regulating Voltage

QUESTION H31—A 37½-kva, single phase 480- to 120-volt transformer feeds a large number of automatic electronic calculating machines. The burning out of relays and other troubles occurring in these machines is continuous. We now have a recording voltmeter on the load side which records the voltage over a 24-hour period. The voltage varies from 118 volts to 132 volts. The local power company has already told us that the lines feeding this plant are not regulated at the power house, and our company will have to take care of its own regulation. Can anyone suggest a method of automatically stabilizing the voltage to 120 volts on the load side of the transformer?—R.A.M.

ANSWER TO H31: There are two ways to regulate the voltage for this application and the choice would depend on which costs the most. If the transformer is outside, a pole-top oil-immersed voltage regulator such as is used for distribution lines could be used. Or an askarel-filled one if indoors. This would regulate within 2½%, in increments. If closer regulation is needed, or if it must be continuous instead of step-regulating, then a constant-voltage transformer, such as Sola Electric Co's unit, could be put between the power transformer and the load.—E.A.M.

ANSWER TO H31—One of the most practical methods of stabilizing the voltage on the load side of the transformer is to install a single-phase dry-type induction voltage regulator. If your load does not exceed 300 amps for example, a 3.6 kva automatically-operated regulator rated for continuous service with plus or minus 10% regulation at 120 volts would suffice. This is a series device carrying the full load current with buck or boost coils capable of lowering or raising the load voltage within the limits of 108 and 132 volts, thus stabilizing the load at 120 volts.

Any of the equipment manufacturers or supply houses listed in EC&M would be delighted to send the necessary descriptive literature and requirements for ordering.—R.G.O.

ANSWER TO H31—The load side voltage of this transformer can be automatically stabilized to 120 volts by use of a constant-voltage transformer, providing a constant output voltage regardless of load change or variation of the input voltage. These are obtainable from the General Electric Company, The Superior Electric Company, Bristol, Conn., or the Sola Electric Company, Chicago, Ill. The 37½-kva transformer may be too large to regulate on the 120-volt secondary side with a single unit, however the 480-volt supplied to the primary of the power transformer could be stabilized resulting in constant 120-volt output from the secondary side of the transformer.—R.R.M.

Improving Power Factor On Induction Motors

QUESTION J31—Where an induction motor has more than one winding per phase and the windings in each phase are connected in series, could the power factor of the induction motor be improved by connecting a capacitor across one winding in each phase and depending on the autotransformer effect to introduce a leading current into the induction motor? Would this have any detrimental effect on the motor? Would the beneficial effect be greater than the detrimental effect?—E.B.

ANSWER TO J31: Such an arrangement would introduce circulating currents that might produce local heating and erratic operation. It is also doubtful that the power factor would be corrected as effectively as with the capacitors connected at the motor terminals.

The capacitive kva required will be entirely dependent upon the reactive kva, and will not be increased or decreased by "autotransformer" action. Therefore, this scheme would result in no net gain, and would entail a large amount of labor in connecting the capacitors to the motor coils.—D.H.N.

ANSWER TO J31—The type of motor you indicate was primarily

designed as a multispeed motor whereby the different coils could be arranged for various speed application. By introducing a capacitor across one winding of each phase, the equivalent impedance would be changed since the resistance and inductance of the winding would be in parallel with the capacitor added.

Whether this addition would be beneficial in producing a better power factor is debatable. The overall gain may be an improvement in performance at a reduced load.

However, it seems that you are attempting to incorporate a feature of the single-phase split phase induction motor without using a separate winding for the main winding and one for the starting winding. The capacitor in a capacitor start or run motor is to improve the starting characteristics of the single-phase motor.

Whether this addition to a poly-phase motor is applicable can be justified by trying it and running a performance test on it.—J.B.K.

ANSWER TO J31—This is an expensive and cumbersome way to do a simple job. A 3-phase capacitor connected across the motor terminals would accomplish the power factor improvement better and with simpler connections. The capacitor connected across the motor winding might, in some cases, set up a circuit approaching resonance, and cause a heavier-than-normal current in the part of the winding connected to it.—E.A.M.

Testing Field Coils

QUESTION K31—Could someone tell me an economical way of testing field coils in universal type motors, such as drills, saws, vacuum cleaners, etc.? Most are too small for an internal growler to fit into and it would take an expensive ohmmeter to find a short coil.—C.H.

ANSWER TO K31: In testing for internal shorts in field coils of small universal and shaded pole motors, I have had very satisfactory results with an armature growler and a low reading ac voltmeter.

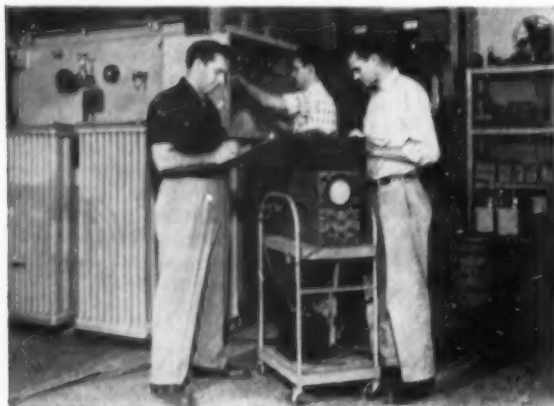
By placing the entire field assembly in the jaws of the growler, a



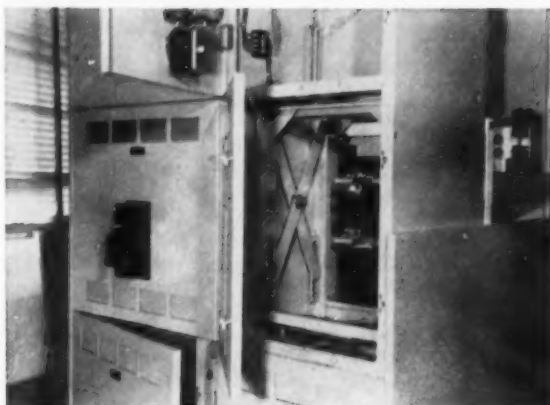
SECONDARY UNIT SUBSTATIONS



ENGINEERED AT I-T-E and coordinated to meet the operating conditions found in your plant.



TESTED AT I-T-E to assure ease of installation, and top performance under operating conditions.

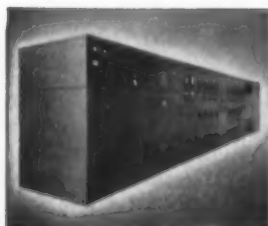


BUILT AT I-T-E with such extra features as circuit breaker test-position with doors closed.



SHIPPED FROM I-T-E to assure prompt delivery of one complete "package," ready to install.

I-T-E MAKES IT EASY TO BUY COMPLETELY COORDINATED UNITS



Only I-T-E builds transformers and switchgear in the same plant. This permits them to assume all responsibility for your unit substation requirements. Close association of engineering and production relieves you of detailed planning, paperwork, and the problems of coordinating deliveries. Shipment is from one location. Installation is speeded. Substation components are completely inte-

grated to provide top performance at low overall cost.

Typical of the extra value which *only* I-T-E Unit Substations offer is circuit breaker test-position with doors closed—and without removing them. This means additional safety to operating personnel, greater cleanliness, simplified tagging out of circuits, and longer life. I-T-E Secondary Unit Substations can be supplied for any application, indoor or outdoor, and in any standard rating. For details, contact the I-T-E sales office nearest you. Or write I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa.

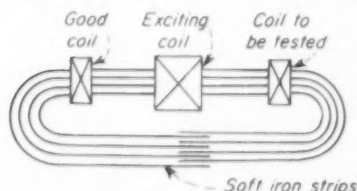
I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

suitable voltage can be induced in the coils to obtain a reading on the meter.

With a little practice in positioning the field assembly in the growler and noting the output of various sizes of coils, a fault can be detected by the variations in the reading between the coils.

A shorted coil, because of the short, will have a reduction in the number of effective turns and will show a lower reading than a good coil of the same size.—J.M.J.

ANSWER TO K31—To test field coils, or any coils, use one coil known to be good, the coil to be tested, and an exciting coil. The exciting coil can be any coil that will fit around the iron strips. Soft iron strips are passed through the three coils, arranged as shown in the diagram. The ends of the iron strips



should be clamped together tightly to reduce the reluctance of the magnetic circuit. Care should be taken not to over-excite or saturate the iron.

The two coils to be tested are placed on each side of the exciting coil with their centers exactly the same distance from the exciting coil. The voltage induced in the two field coils is measured with a voltmeter while the exciting coil is furnishing flux to excite the coils.

The number of turns in coil under test can be determined by the following formula;

$$N1 \div N2 = E1 \div E2, \text{ where}$$

N1 = No. of turns in good coil

N2 = No. of turns in coil to be tested

E1 = Voltage of good coil

E2 = Voltage of coil to be tested.

If both field coil voltages read alike suspected coil is O.K. To check, reverse the positions of the coils.—H.R.S.

Further Discussion on Generator Short Circuit

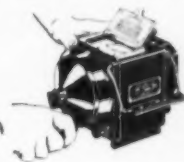
Ordinarily folks don't short circuit a generator under load. But if they did what would happen? JBK's Reader's Quiz Question B31 answered by readers on page 157 of the December issue appeared to

MEGGER[®] ELECTRICAL INSULATION TESTERS

Ratings up to
2000 Megohms
and 1000
Volts DC

...in types to suit varying needs
of ELECTRICAL MEN
for Shop and Field Use

HAND CRANK MEG TYPE of Megger Insulation Tester is a reliable field instrument, light, sturdy, with a constant-voltage type generator—no dependence on batteries or other current supply. By far the most popular instrument among electrical plant maintenance men. Easy to use—easy to read—and rugged in constant services. **BULLETIN 21-45-ECM.**



RECTIFIER OPERATED MEG TYPE

of Megger Insulation Tester simply plugs into a convenient outlet. Portable or flush bench-mounted. A dependable production or inspection instrument. Quick, easy readings speed up otherwise costly tests.



DUAL-OPERATED MEG TYPE

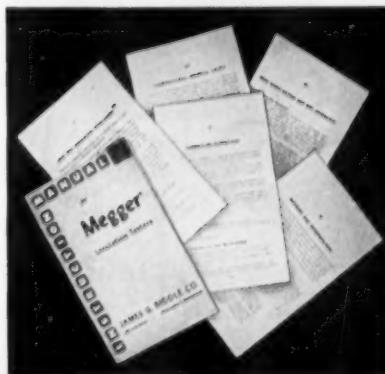


of Megger Insulation Tester may be operated by hand or rectifier. Excellent solution for those requiring a versatile instrument for field and bench use. **BULLETIN 21-46-ECM.**

HELPFUL, FILEWORTHY DATA

on ELECTRICAL PREVENTIVE MAINTENANCE

The new Fifth Edition of the Instruction Manual for Megger Insulation Resistance Testers is expanded to 100 pages. Fourteen chapters are devoted to a complete education for the practical man who is responsible for electrical equipment. Ideal for classroom or staff instruction. Your copy will be mailed free if you write on your company letterhead for **MANUAL 21-J-ECM**



JAMES G. BIDDLE CO.

ELECTRICAL TESTING INSTRUMENTS

SPEED MEASURING INSTRUMENTS

LABORATORY & SCIENTIFIC EQUIPMENT

1316 ARCH STREET, PHILADELPHIA 7, PA.

James G. Biddle Co.
1316 Arch St., Phila. 7, Pa.

Gentlemen:

Please send me material checked:

☐ 21-45-ECM ☐ 21-46-ECM
☐ 21-J-ECM

NAME

JOB FUNCTION

COMPANY

ADDRESS

Hey Al, do your
other customers
like this
ROYAL ELECTRIC
portable cord, too?



us to dispose of an apparently simple matter. But other readers took exception at some length and in no uncertain terms.

Well, Reader's Quiz is the reader's forum and all we should do is referee. But we admit considerable agreement with the later entrants. Question B31 and their comments follow:

What would happen if a 3-phase short circuit was applied to the output leads of a 3-phase ac generator carrying load? The short circuit is applied at the output terminals of the generator. Would it stop, increase speed or remain the same as if it were carrying load?—J.B.K.

The answers to question B31, published in the December issue of your magazine are not completely correct.

First, to answer the question, the generator would tend to increase in speed, if turbine or engine driven. How much it would accelerate would depend upon the prime mover. The reason that this is so, is that most of the impedance to the flow of short circuit currents is reactive. The actual resistance is low and therefore the power output low.

The initial current, limited principally by the subtransient reactance of the generator, is greater than normal. However within a few seconds this current will decay to a value not much greater than normal. Thus a three-phase fault on a lone generator should not produce much damage except that produced at the arcing at the fault. If a regulator is on the system, attempting to maintain the correct output voltage, the generator current will increase due to increase in excitation. However this would not usually be great.

A single phase fault would be worse because it would produce excessive heating in the generator rotor, due to the fact that the stator currents, in this case, induce excessive rotor currents. This could cause damage, if sustained any appreciable time.

If the generator is in parallel with other generators, or supplying motor load, these machines will also supply fault currents. The usual fault is not a bolted fault but rather an arcing fault. The energy dissipated in this arc is a major cause of damage.—J.T.J.

I am somewhat surprised by the answers published in your quiz section on question B31 regarding short circuits on ac generators.

The synchronous reactance of

They sure do, Roy!
All you contractors
seem to go for
ROYAL quality
and dependability



Yes, the big favorite with both contractors and maintenance men is Royal, the quality portable cord on the familiar orange and blue spools, in the new "HANDI-PAK" cartons. There's a construction that's right for every job — with rubber, neoprene, or plastic jacket — all surface-marked for positive, easy identification. Next time, be sure you ask for and get ROYAL at your wholesaler's.

Underwriters' Laboratories
Listed, of course

ROYAL

ROYAL ELECTRIC CORPORATION
PAWTUCKET
RHODE ISLAND



modern machines is usually on the order of 100% and any steady-state shortcircuit current flowing as a result of a three-phase bolted short circuit across its terminals would not greatly exceed normal full-load current unless a voltage regulator employing field forcing is used.

Naturally the initial surge of current would be limited by the subtransient reactance of the machine, which on modern machines runs around 8 to 12%. This would give a current of ten times normal full load current, and if the short were initiated as the voltage is passing thru zero, the dc off-set component would multiply this figure by a theoretical 1.73, or practical 1.6. I grant that 16 times normal current is a tremendous mechanical and thermal stress on the generator, but modern machines are designed to withstand these stresses for the relatively short time during which they exist.

It is interesting to note that, depending on the ratio of zero sequence reactance to positive sequence reactance, the currents flowing due to single phase short circuits can and often do exceed those caused by a symmetrical three-phase bolted fault. Manufacturers guarantee their machines against the latter but always recommend the use of a resistor or reactor, in the neutral to ground connection, sized to limit the single phase short circuit to a value not to exceed the magnitude of a fault.

Since the ratio of reactance to resistance of a modern machine is very large, the power factor of a short circuit load is practically zero, and the load on the turbine or other prime mover driving the generator is actually reduced; if the prime mover's speed is not held down by the governor it would most probably speed up after the initial shock due to transient current flow. Another way of looking at this is to remember that under short circuit conditions (at the terminals of the machine) the voltage output of the machine is zero, and the only load on the turbine is the combined losses of the exciter, the field, and the resistance loss in the armature.

I have frequently dried out small industrial generators (7500 to 10000 kw) by circulating full load current thru the short circuited armature. When doing this, field current is usually close to that required for obtaining normal open circuit voltage, and the steam consumption of the turbine is very low indeed.



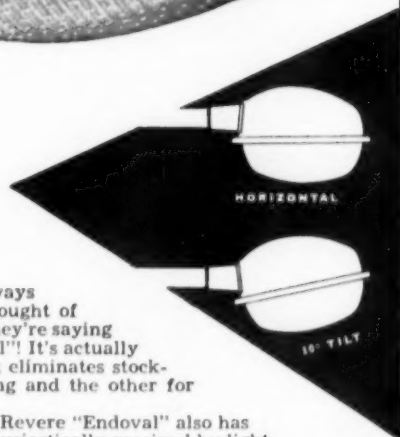
Revere
ELECTRIC MFG. CO. CHICAGO, U.S.A.

The
2 in 1
LUMINAIRE
...that's TOPS in Design and Efficiency



UNIQUE REVERSIBLE SLIPFITTER ...

Provides
10° TILT
AND
HORIZONTAL MOUNTING!



Of the good things ... it's always said: "Why hasn't someone thought of that before?" And that's what they're saying about the New Revere "Endoval"! It's actually two luminaires in one—since it eliminates stocking one for horizontal mounting and the other for 10° tilt.

But, that isn't all ... the New Revere "Endoval" also has a host of other advantages enthusiastically received by lighting engineers everywhere. Everything about the Luminaire is precision built! The housing is of precision, die-cast aluminum alloy. The reflector is of one-piece W-Modified Parabolic design which offers sharp, vertical cut-off and proper I.E.S. distribution patterns without the use of lifting prisms. You obtain fullest utilization of lamp output. Reflector cannot be inserted wrong. Perfect alignment assured at all times ... cannot work loose ... no tools needed to release it!

Integrally cast "lift-off" type hinge allows easy removal of glass. Compression-type, die-cast aluminum alloy holding ring allows for expansion and contraction of the glassware without strain. Spring-loaded roller latch automatically clamps lens ring and holds glassware tight—no dust or bugs can enter.

All the above, coupled with lightness in weight, greater strength, more attractive size and shape, finer finish, ample wiring area and simple terminal connections make the New Revere "Endoval" tops in design—tops in performance and tops in value. Investigate today. Write for Brochure 700-9.

REVERE ELECTRIC MFG. CO. • 6009-17 BROADWAY • CHICAGO 40, ILL.
Available in Canada thru Curtis Lighting, Ltd., Leaside, Toronto, Ontario

THE ONLY COMPLETE LINE OF LUMINAIRES • FLOODLIGHTS AND POLES FOR STREET • SPORTS AIRPORT • SERVICE STATION • OUTDOOR THEATRE • MARINE AND INDUSTRIAL LIGHTING

Make accurate Repeat bends Easily!



EXCLUSIVE CALIBRATED DEGREE SCALE ELIMINATES GUESSWORK

SMOOTH UNIFORM BENDS

Repeat bends, as well as smooth offset and 180° bends, are easy and fast to make. When using a "Chicago" pipe bender you always turn out professional work quickly without any special skill. The accurate bending sector does the work and supports the full length of bend.

RUGGED... PORTABLE

An occasional drop of oil on the powerful toggle-ratchet mechanism is the only maintenance required. There are no loose parts to be misplaced or lost. Its light weight, 66 lbs., makes it a real on-the-job tool... always at a comfortable working height.

*No. 1—66 lbs.
No. 2—89 lbs.

Illustrated...
No. 2 for bending
1" to 1½" conduit



WRITE FOR
FREE
ILLUSTRATED
FOLDER



SEND TO:
G. LIDSEEN, INC.
1050 FIRST STREET, HAYESVILLE, N. C.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____

Please do not construe this letter as an encouragement for indiscriminately placing short circuits on generators; even though generators now-a-days are designed to take them, they are still pretty rough on the machine and should be avoided at all costs. I merely wish to point out some facts which obviously seem to have been overlooked in the published answers.—H.H.L.

Can You ANSWER These QUESTIONS?

QUESTION U31—We have two 250-kva projection press welders, 440 volts, single phase and 31% power factor each. Each welder is to be connected to each phase of an ungrounded, 3-phase, 440-volt delta "plug-in" bus duct system.

(a) What would be the unbalanced line current in the third phase, when both welders are "on" or welding in the other two phases?

(b) What would the line currents be in each of the other phases if only one welder was "on" or welding in the other phase?—G.J.P.

QUESTION V31—I would be interested in knowing what actual voltage variations are considered good operation in lighting and power systems. The NEC limits voltage drops on power feeders to 3% and on light feeders to 1%. This, however, does not take into account the voltage drop in branch circuits, service conductors, transformer regulation, and all of the voltage fluctuations in the rest of the system. I would be interested in knowing what is allowed from the theoretical and the actual operating points of view.—O. B. T.

QUESTION W31—Which is better for relay contact arc suppression, capacitors or rectifiers? Can they be used equally well on ac as dc? Finally, how does one calculate the correct size to use?—J. M.

QUESTION X31—Why do some refrigerator firms insist that I should use a 20-amp fusetron for a 12-amp air conditioner even though the nameplate and my ammeter show that 12 amps should be enough?—H. S.

PLEASE SEND IN
YOUR ANSWERS BY MARCH 15

SAVE

costly motor rewinds



PROTECT

valuable switch gear
and transformers



PREVENT

fire damage and
personnel injury



with this

ELECTRONIC WARNING DEVICE

for 440 v. 3-phase
ungrounded systems

When a ground develops you are warned immediately if your system is protected with the DELTA-DESCO GROUND ALERT. A bright RED light flashes on and a BELL inside the instrument starts to ring. The red light continues to burn until the ground is corrected and the bell rings until switched off. When the system is ground-free a GREEN light burns continuously.

Low cost. Simple operation. Portable or stationary models.

Don't wait until trouble strikes.

WRITE FOR DESCRIPTIVE BOOKLET
—TODAY!

DELTA-DESCO COMPANIES

DELTA ENGINEERING SALES CO.

539 Aero Drive
SHREVEPORT,
LOUISIANA



For use
with
440 v.
3-phase
ungrounded
systems

DELTA-DESCO
Electronic
GROUND ALERT



Speeds through brittle fibre pipe slick as a whistle!

Rugged B&D Heavy-Duty Jig Saw zips through jobs!

**POWER-BUILT design to make
your installations easier!**

Designed for the toughest jobs, the versatile Black & Decker Heavy-Duty Jig Saw is powered to save you muscle and manhours. Combines a sabre, rip, crosscut, coping, hand, hack and keyhole saw in one hand-fitting tool. Makes curved, straight or irregular cuts—pocket cuts in floors, baseboards and panels. Full 1" stroke . . . cuts to a 45° angle on either side.

Heavy-Duty, B&D-built motor won't stall, runs cool, without vibration. Heavy-duty shoe won't wobble or distort. See your B&D distributor for a free demonstration—you'll wonder how you ever did without one! Or, for full details, write: THE BLACK & DECKER MFG. CO., Dept. 2302, Towson 4, Maryland. (In Canada: 80-86 Fleet St., E., Toronto 2, Ontario.)



Leading Distributors Everywhere Sell



Black & Decker®

Portable Electric Tools—Power-Built to Last



DRILLS



BENCH GRINDERS



SANDERS



SHEARS



Slices through sheet metal like a knife through butter!



Cuts neat, clean holes in wood: 1" hard-wood; 2" in soft.

Makes pocket - cuts quickly and easily.



Cutting pass-through holes in ceilings is a cinch!

WHY

settle for an ordinary voltage tester?

The Amprobe Jr. gives you so much more! And the cost is only \$19.85 (just a few dollars more than an ordinary voltage tester).

Why be half-equipped with just a voltage tester? The **Amprobe Jr.** meets all your testing needs...measures voltage and current instantly and accurately without shutting down equipment. All this with one rugged and inexpensive pocket-size tester!

There's an **Amprobe Jr.** for every job... five different current models in either 125-250 V. A-C, or 150-600 V. A-C. Have your jobber show you the model that fits your job best.

Send for valuable **Amprobe** literature showing how you can do a better job in less time. Mail coupon now to: PYRAMID INSTRUMENT CORP., LYNBROOK, N. Y. (Export Div.: 45B Broadway, N. Y. 14), world's largest manufacturer of snap-around volt-ammeters.

Send For Free Service Bulletin

Pyramid Instrument Corp., Dept. JEC27, Lynbrook, N. Y.
Please send me the Amprobe service bulletins checked

- ☐ How to cut costs and land more jobs
- ☐ Trouble-shooting electric motors
- ☐ How to boost service profits
- ☐ Electrical servicing of hermetic units

NAME _____

COMPANY _____

ADDRESS _____

CITY _____

ZONE _____

STATE _____

BEFORE YOU BUY...

ask yourself these questions

the
AMPROBE
Junior

ordinary
voltage
tester

Does it measure current as well as voltage?

YES

NO

Does it give you full visibility on a graduated reading scale?

YES

NO

Does it fit conveniently in your pocket?

YES

YES

Does it measure within $\pm 3\%$ accuracy?

YES

NO

Does it come in a full line of models to meet different problems?

YES

NO

Does it protect you against shorts and shocks?

YES

YES

Does it balance loads, locate grounds, determine motor overloads, check rating of circuit breakers?

YES

NO

\$19.85



ACTUAL
SIZE

snap-around volt-amp tester

AMPROBE JR.®

Questions on the Code

Answered by:

B. A. McDONALD, New York Board of Fire Underwriters, Rochester, N. Y.

GLENN ROWELL, Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.

B. Z. SEGALL, Consulting Electrical Engineer, New Orleans, La.

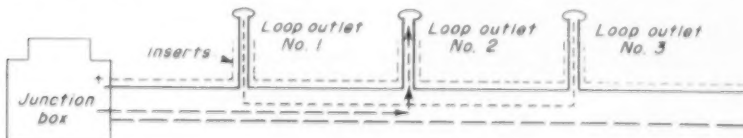
Underfloor Raceways-Loop Wiring

Q. In the October, 1956 issue of *Electrical Construction and Maintenance*, I note on page 212 a reference to Interpretation No. 427, concerning section 3546-3547.

Below is a sketch of what I understood as the meaning of Interpretation No. 427. I presume that there will be further discussion of this question.—C.L.

A. Up to the present time, I have not received a reply from the Chairman of Panel No. 8 concerning my personal opinion of the significance of O. I. No. 427. I agree with your concept of this interpretation as shown by your illustration. These opinions are personal and my main objective in contacting the Chairman of Panel No. 8 was to obtain an opinion that would be authoritative, and to let him know that a question of intent does exist.

To me, it is quite obvious that the interpretation permits the looping of wires and this opinion is undoubtedly shared by the members attending the recent meeting of the Southern Section, IAEI, held in Dallas, Texas. I have just been advised by the Secretary of the Southern Section, A. M. Miller, that his Section does not agree with the finding of O. I. 427 and recommends provisions specifically prohibiting such procedure.



I feel that the intent of O. I. 427 is to avoid any splices or unused conductors in raceway.

If outlet No. 2 were removed the new conductors would take the path of the dotted line and the old conductors from outlet No. 2 to outlets No. 1 and No. 3 would be removed.

If outlet No. 1 were abandoned new conductors shown by the broken line would be run direct to outlet No. 2 and the old conductors from outlet No. 1 to the junction box and outlet No. 2 would be removed.

If at any time outlet No. 3 were discontinued all conductors between outlet 2 and 3 would be removed.

Insofar as Abbot's Electrical Code Handbook and B. Z. Segall's Code Diagrams are concerned, it must be remembered that the opinions expressed were given before the date of the interpretation in March 1956. In other words, the interpretation clarified the intent of the rule and is no reflection on previous opinions based on a literal reading of the rules involved.—B.A.McD.

Bowling Alley-Public Assembly

Q. If a bowling alley has a spectator seating capacity of 100 seats and in addition has seating booths at the head of each bowling alley, presumably for use of the persons bowling, would the capacity of these booths be added to the spectator seating capacity in determining whether or not the containing building should be wired as required by Article 520 of the National Electrical Code?—D.G.

A. Under Section 5211 of Article 520 you will find permission to use other than metallic raceway wiring only when the capacity of a building used for public assembly is 100 persons or less. If the bowling alley in question were not open for general public bowling, it is possible a person could question whether or not the booths for participants should be

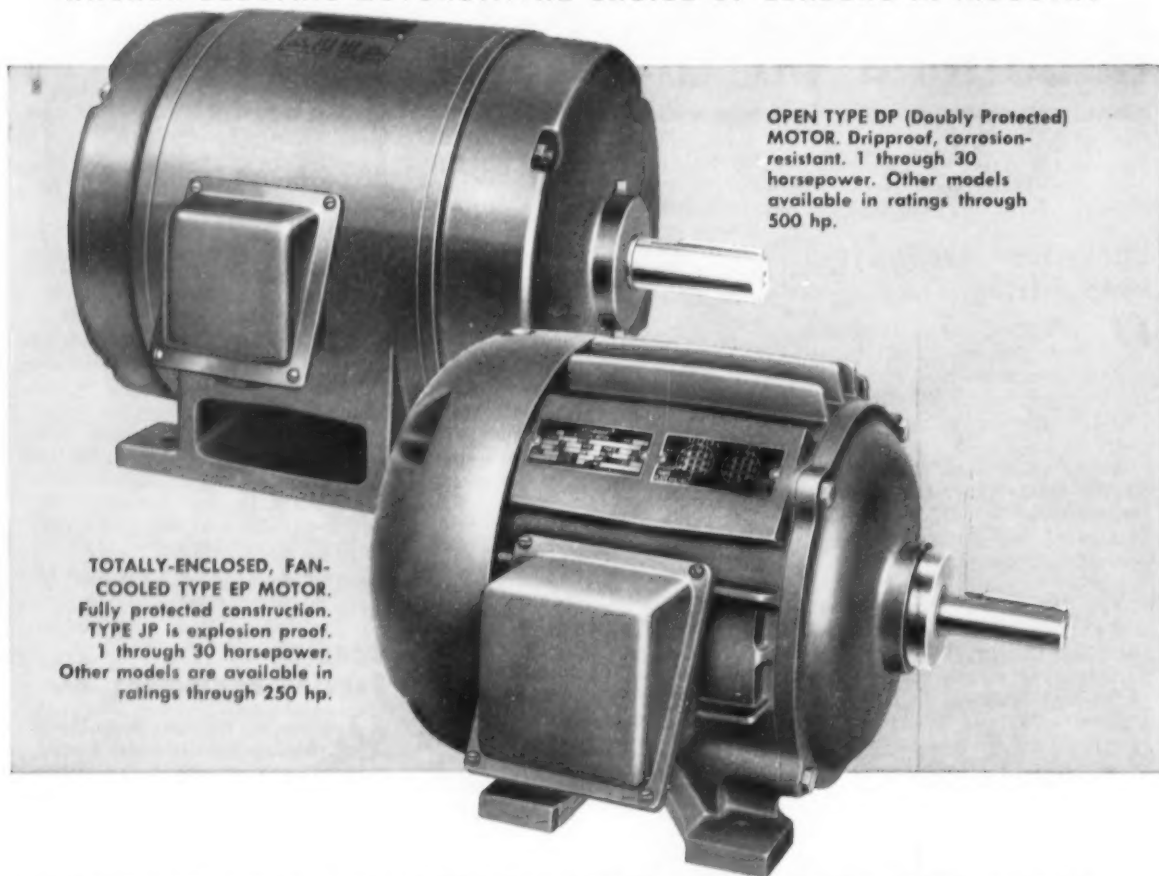
included in the seat count for the alley. But it would be my personal opinion that an inspection agency would be justified in any public alley in counting both the seating of the booths with the normal spectator seating in arriving at a seat count to determine whether or not the building should be wired with metallic raceway. It would therefore seem advisable that this be discussed with your inspection department before arriving at a definite conclusion.—G.R.

Bonding at Service Equipment

Q. On a service installation having first, a meter device, then an entrance switch, is it necessary to bond the conduit leaving the entrance switch that is feeding a panel a distance away?—P.E.P.

A. Section 2571 of the Code covers the point in question. In the August edition of E.C.&M., Fig. No. 3 on Page 77, the point you have raised is illustrated and the following comment given: Personally I do not believe that a bonding bushing would be required at the point marked with a question mark (this is where the feeder conduit leaves the main switch and runs to a panel), since the conductors contained therein are properly fused at the main switch and are not service conductors. Some authorities require a bonding bushing on this feeder conduit but I doubt that such procedure is required by the Code.

The principal reason for bonding at services concerns the fact that service conductors do not have overcurrent protection and when a fault occurs the path to ground should be adequate to carry the unlimited amount of current which may flow over the conductors and the metallic raceways in the ground circuit. When a fault occurs on the feeder conduit the current inrush is limited by the service fuses and the necessity for bonding this conduit to the main switch is consider-



OPEN TYPE DP (Doubly Protected) MOTOR. Dripproof, corrosion-resistant. 1 through 30 horsepower. Other models available in ratings through 500 hp.

TOTALLY-ENCLOSED, FAN-COOLED TYPE EP MOTOR. Fully protected construction. TYPE JP is explosion proof. 1 through 30 horsepower. Other models are available in ratings through 250 hp.

OPEN TYPE OR TOTALLY ENCLOSED MOTORS... Wagner offers **MORE** for your motor dollar!

- **MORE POWER IN LESS SPACE...** These motors are built in NEMA frame sizes 182 through 326 U. They pack more power into less space for easier handling and stocking—require less space for installations.
- **CORROSION-RESISTANT FRAMES...** Both types are built with rugged, corrosion-resistant cast iron frames. Motor feet are cast as an integral part of the frame for maximum strength and rigidity.
- **THE TYPE OF PROTECTION YOU NEED...** Type DP motors have completely dripproof—virtually splash-proof enclosures; while type EP is totally enclosed, fan-cooled for complete protection; and type JP adds explosion proof features.
- **COOLER OPERATION...** Special baffles direct a cooling flow of air through the DP motor. Types EP and JP are fan-cooled and have ribbed frames to increase the surface area for more efficient cooling.
- **LONGER BEARING LIFE...** These motors can be re-greased when desired to prolong bearing life. Fresh grease can be added—old grease removed through openings provided in the bearing housing.
- **WAGNER DEPENDABILITY...** These two motors have the same high Wagner quality, will give the same long life performance, that have made Wagner Motors a known value for sixty-five years.
- Let a Wagner field engineer, expert on motor applications, show you how these motors can be applied to your needs. Call the nearest of our 32 branch offices, or write us. Bulletins MU-202 and MU-203 give complete information on these Wagner Motors. Write for your file copies today.

M57-4



BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6413 Plymouth Ave., St. Louis 14, Mo., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

ably reduced. If a bond were required at this point, it appears to me that a similar bond must be placed at the panel.

This is my personal opinion of the bonding provisions of Section 2571 and while I am not averse to installing a grounding bushing on the feeder conduit, I do not believe that the intent of this Code rule requires same.—B.A.McD.

Motor Overcurrent Protection

Q. For many applications it is necessary that the motor driving the application be jogged or inched along. A thermal overload relay that is selected in accordance with the Code will invariably trip due to this severe jogging.

Increasing the overload relay size will stop the tripping but normal running overcurrent protection is lost. What would you recommend be done and still comply with the Code?—C.G.

A. Section 4324 offers some relief for your problem. You will note that the rating may be increased to 140% of the full load current rating for motors having a temperature rise of 40C or less and the rating may be increased to 130% of all other motors. In many cases this increase will be sufficient for proper operation of the motor.

If this increased size does not permit proper jogging or inching, it will be necessary to obtain the proper protective devices from the manufacturer. In most cases the equipment manufacturer does provide the approved protective devices for this particular equipment.—B.Z.S.

Derating Conductors

Q. We are installing a new electric control room in a grain elevator in this city and plan to use a wireway below the magnetic controls for the various motors in this elevator. As nine different motors, some of them rather large, are controlled from this one dust-tight room, there will be 27 current-carrying conductors contained within this wireway at one point in its cross section. Must we derate these conductors?—J.B.



NOW...

Set a 1/4" stud
in steel or
concrete with
one light tap!

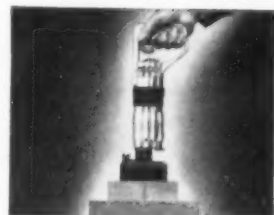
ONLY
\$ **34.75**

NEW Remington "Mighty-Mite" STUD DRIVER

HERE'S the new handy-sized cartridge-powered Remington stud driver that handles all fastening jobs requiring a 1/4" stud. "Mighty-Mite" sets a stud a minute—with no pre-drilling or outside power required, and it's yours for only \$34.75.

"Mighty-Mite" is compact and easy to operate. Simply unscrew the upper assembly, insert the 22 caliber cartridge with the desired 1/4" stud, and you're ready to anchor wood sections or steel fixtures to concrete or steel! One light tap of a hammer or mallet on the firing pin and your stud is set firmly in place, straight as an arrow.

We have all the facts about the new Remington "Mighty-Mite" in an illustrated free booklet. Included are many applications, with pictures, of this versatile stud driver that pays for itself in just a few fastenings. Send for your copy today by mailing the coupon below.



"Mighty-Mite" is the low-cost companion tool to the Model 455—medium and heavy-duty Remington Stud Driver.

Remington



Industrial Sales Div., Dept ECM-2
Remington Arms Company, Inc.
Bridgeport 2, Conn.

Please send me your free booklet which shows how I can speed the job and save with the new Remington "Mighty-Mite" Stud Driver.

Name _____ Position _____
Firm _____
Address _____
City _____ State _____



COST no more

(THAN ORDINARY)
EARED BOXES

UNION'S "SNAP-IN"

OUTLET & SWITCH BOXES



WITH ALL THESE
TIMESAIVING FEATURES

1. Quick convenient snap-in mounting.
2. No awkward metal straps needed.
3. Ears fixed in "exactly right" position.
4. Plates fit snugly everytime.



Write for
literature and
free samples.

UNION INSULATING CO.
PARKERSBURG, WEST VIRGINIA

A. At the present time the Code does not require derating of conductors when contained within a wireway; but unless these conductors are derated, it is entirely likely that you can expect serious overheating within the wireway unless it is of unusual cross-sectional area and unless the conductors are so spaced that they can readily dissipate their heat. At the present time the National Electrical Code Committees are planning a change in the Code relative to such a condition which will require at some time in the future actual derating of conductors contained within a wireway much as the derating is now required where more than three conductors are contained within raceways.—G.R.

Separate Services and Meters

Q. Our permit fee in Quincy for service reads as follows: "Service and Meter Connections each—\$.50."

In the past, for dwellings with more than one meter we have paid 50 cents for the service and 50 cents for each meter. In other words, for a four-family apartment in the past, we paid \$2.50. We have just acquired a new inspector who claims, in fact insists, we pay \$1.00 for each meter. His reasoning behind this ruling is that he considers each meter as a separate service. So, for a four-family apartment the fee is now \$4.00. We claim his ruling is in direct violation of the National Electrical Code. As we interpret the Code, it allows but one service only, except different classes of use, which we do not have in this particular case. We would appreciate an interpretation by someone in authority such as yourself and I am sure the inspector would appreciate an unbiased interpretation also.—N.C.B.

A. I assume that the fee under discussion concerns permits and is not concerned with inspection fees.

Insofar as the Code is concerned a service is defined as follows: "The conductors and equipment for delivering energy from the electricity supply system to the wiring system of the premises served."

According to this definition the service includes the overhead or underground service conductors, the service entrance conductors,

What are YOUR

RECTIFIER
REQUIREMENTS



- Selenium?
- Germanium?
- Silicon?

You get all these *pluses* when you use Walker Rectifiers: low DC ripple — about 4% . . . low cost . . . long, efficient life . . . no maintenance. All Walker Rectifiers are designed and built to the highest standards, with the highest quality components.

With Walker Rectifiers you install them and forget them as far as maintenance or repair is concerned. Get full details on Walker Rectifiers — Selenium, Germanium or Silicon — write for complete details or engineering assistance.



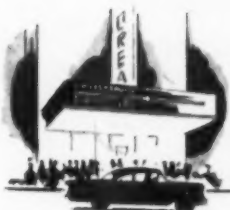
THE WALKER DIVISION

NORMA-HOFFMANN
BEARINGS CORPORATION
Stamford, Connecticut

EVERY BUILDING



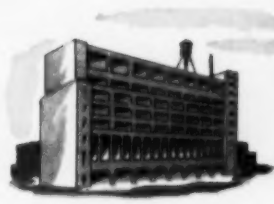
Schools



Theaters



Institutions

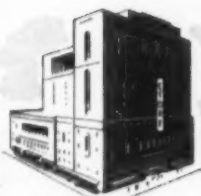


Warehouses

EVERY BUSINESS



Restaurants



Stores



Factories



Offices

NEEDS EMERGENCY LIGHTING

Get in on the ground floor with an item that people really *need*. Become a dealer for Exide Lightguard® Emergency Lighting Units—foremost in the field. Most customers buy several. They're required by law in some communities. Send coupon today.



When power fails and lights go out, Exide Lightguard Emergency Lighting Units go on—instantly and automatically. Plug into regular outlets. Built-in charger. Batteries last for years.

Exide® Industrial Division
Electric Storage Battery Company, Phila. 2, Pa.
Send details on Exide Lightguards.

Name _____
Street _____
City _____ Zone _____ State _____
My business is _____

16



STEBER

"SERIES 4000" FLOODLIGHTS

**First choice among lighting men for sports,
commercial and industrial lighting**

"Series 4000" Floodlights are designed to meet NEMA specifications and are available in a variety of beam patterns and with mounting provisions for every application. Write for complete details—See how Steber features provide better lighting at lower cost.

Other Steber Series of floodlights—open and enclosed types from 100 to 1500 watts, are available in deluxe and economy models.

**New Floodlighting Literature available now.
Write for your copy today.**

Lighting Units **STEBER** *for Every Need*

STEBER MANUFACTURING CO. • Dept. 98, Broadview, Illinois

STEBER MANUFACTURING CO. OF CALIFORNIA
242 So. Anderson St., Los Angeles 33, Calif.

STEBER-WOODHOUSE, LTD.
33 Ingram Drive, Toronto, Canada

SOLD THROUGH LEADING DISTRIBUTORS

the service equipment and the service raceway or cable. The service equipment usually consists of circuit breakers or switches and fuses, and meter equipment. In some cases there may be as many as six circuit breakers or switches and six meters which form a part of a service, and such a combination would be considered as one service. In this case the fee in line with your present requirements is 50 cents for the service and 50 cents for each meter which results in a total of \$2.50.

On some installations we may have only one main switch or circuit-breaker and the individual meters for the occupants are tapped from feeders serving meter banks. In such cases the meters are not service equipment but it appears that the 50-cent charge would apply to each meter. As an example, a 30-family apartment house might be served through one service and have 30 individual meters and the resultant fee would appear to be \$15.50.

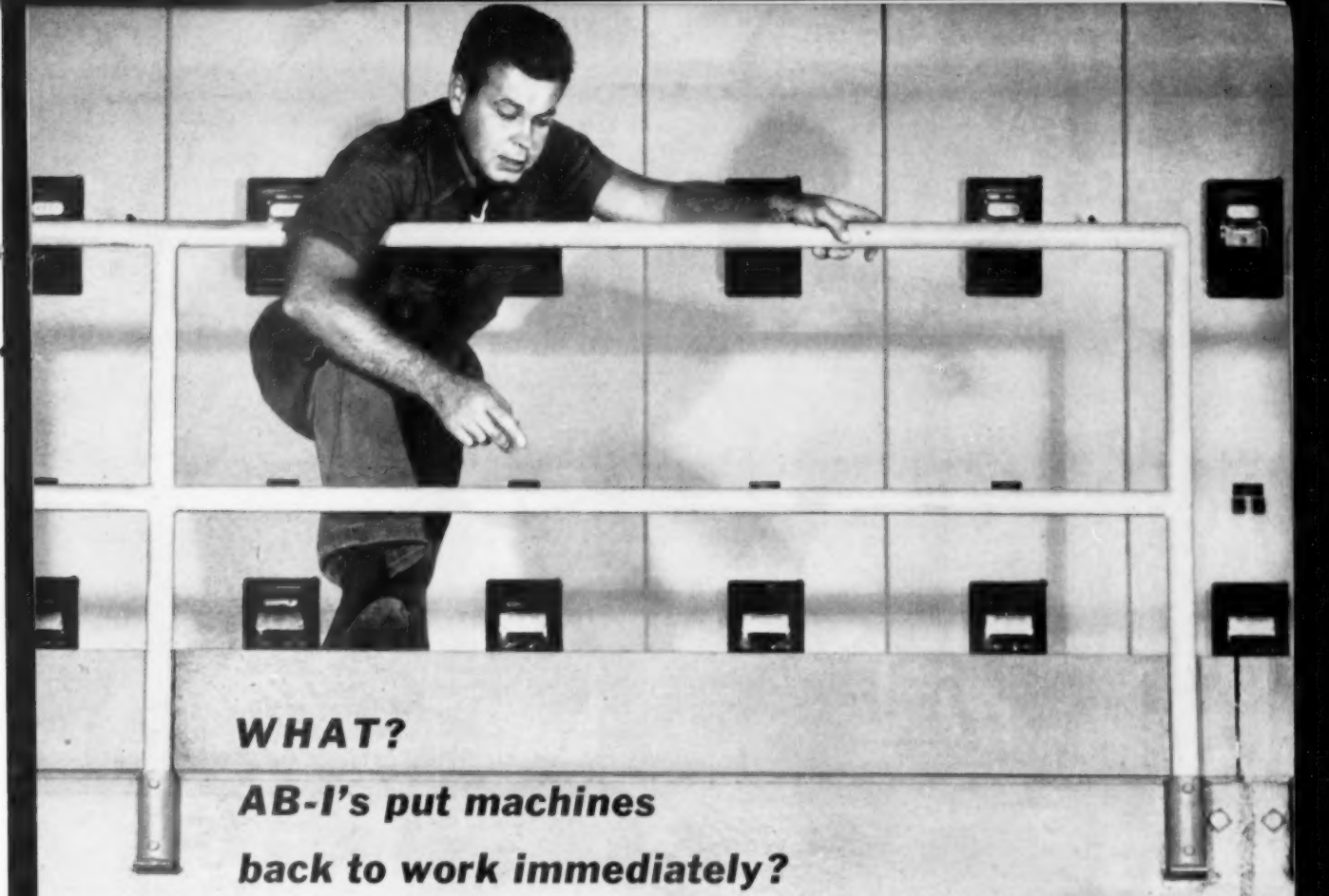
Insofar as the Code definitions of a service and its component parts are concerned, reference to Article 100, under definitions, will show that no direct reference to meter equipment is made. As a result the Code does not infer in any way that a meter constitutes a separate service. The Code does recognize a meter as service equipment under Sections 2352 and 2375 but there is no implication that such meter equipment constitutes a service.

If the local inspector believes that the present provisions for permit fees are not adequate, it appears to me that they should be revised according to the needs of the Bureau.—B.A.McD.

Service Drop Clearances

Q. *In regard to clearance over residential drives and yards by public service drops, does the NEC apply to such wiring? I would like some discussion as some inspectors apply NEC and some apply the Safety Code.—W.A.C.*

A. It should be noted that the 1956 Code has done much to clear up this question of service drop clearances. In Section 2322a a fine print note definitely states that the National Electrical Safety Code applies to all service drops for services operating above 600 volts.



WHAT?

***AB-I's put machines
back to work immediately?***

LIKE LIGHTNING. And in many cases Westinghouse AB-I circuit breakers cost less than safety switches.

With no fuses to replace, no waiting for authorized personnel to correct the fault, anyone can restore service. A flip of the handle does it. If the fault lingers, the exclusive De-ion[®] arc quencher goes into action again.

Can you afford the lost production, the lost profit caused by down time, even temporary down time caused by harmless overloads? When fuses blow, temporary faults take just as long to correct as serious ones.

AB-I circuit breakers are the modern successor to the fused switch. No other protective device can match Westinghouse AB-I's for performance, quality and economy. For further information ask your Westinghouse distributor for Descriptive Bulletin 30-250 or write Westinghouse, P. O. Box 868, Pittsburgh 30, Pa.

J-30226

YOU CAN BE SURE...IF IT'S

Westinghouse





ON at Sunset — OFF at Sunrise . . .

YEAR IN . . . YEAR OUT WITHOUT ATTENTION

1.

Provide Maximum PERFORMANCE

Timing from 40 below zero to 150 above. 35 ampere incandescent lamp load rating—All parts nickel-plated for extra long life.

2.

CONVENIENCE

Continual resetting of ON time unnecessary. OFF setting easily changed from 10:30 P.M. to 1:30 A.M. or sunrise, without removing dial . . . no tools required.

3.

ECONOMY

Completely mechanical—install wherever convenient.

Lug terminals take up to #6 wire without bending.

Save electricity—lighting will not come ON until needed. Labor saving too.

The Tork Astronomic is available in SP, DP, 3P, SPDT DPDT, 2 Circuit, and Momentary contact—with or without our special Skip-A-Day feature.

TORK TIME CONTROLS, INC.

WRITE NOW . . . for details on complete line.

DEPT. Z1, MT. VERNON, N. Y.



The 1956 Code in Section 2324 now requires all points of attachment to buildings to be at least at a height of 10 ft—eliminating permission to go below 10 ft under certain conditions. Another exception which is still emphasized in this Code is that for a 12-ft clearance over residential driveways.

These rules apply to all service drops whether public utility service drops or those installed by others. —B.Z.S.

Fusing the Neutral Conductor

Q. Will you please clear up a question that is costing me money? In "X" County, we can install new service equipment and never have to fuse the neutral on the old knob and tube wiring as long as we maintain the former polarity on the neutral.

In "Y" County we must install 3-wire services and after using a modern circuit breaker panel, place a fuse cutout and fuse the neutral on knob and tube wiring.

As an average mechanic in the trade for the last 20 years, I have never had anything but trouble from the blown neutral fuse when used with a grounded service.

Am I right in maintaining that Section 2409-b applies to portable plants where the polarity could be reversed or on moving shovels and the like where it is impossible to have a fixed ground?—C.W.O.

A. The past history of overcurrent protection of a 2-wire grounded circuit goes back 40 years or more, and the change from 2-pole to single pole circuit protection was promoted by the Code requirement covering the polarity identification of systems and circuits. In support of this contention we quote the following rules:

1920 Code, Section 23-d. "All branches or taps from any 3-wire system which are directly connected to lamp sockets must be run as 2-wire circuits, and all wires of all branch or tap circuits which are directly connected to lamp sockets or other translating devices must be protected by proper fuses except that the grounded conductor of 3-wire distributing circuits must not be fused".

This Code rule was amended in the 1923 Code, Section 807-b as follows (note the reference to an identified grounded conductor):

"By permission of the inspection

4 WAYS TO ILLUMINATING SAVINGS

Specify Sunbeam Lighting Visionaires® as your first step to achieving quality illumination.

Accept no "equals" — there are none.

Plan lighting to make use of Visionaire® ease of installation and extreme versatility. Over 100 basic types are available to meet any installation condition, including modern suspended grid and T-Bar ceiling systems. Look beyond initial costs and evaluate your decision in terms of long-range savings. Quality construction, heavy gauge bodies, durable components, contemporary design and lasting finishes all are synonymous with the Sunbeam Visionaire® symbol.

And finally, look for the Bonderite and U.L. labels assuring lifetime corrosion-resistant finishes and highest standards of construction, design and performance.

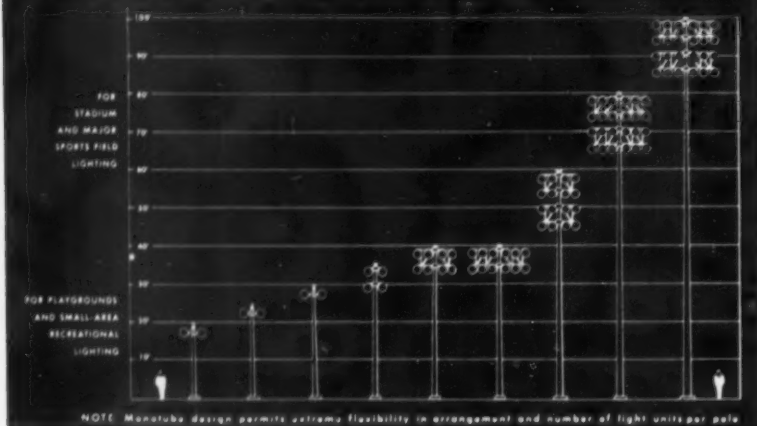
Shown: An installation of HPLM5600 series troffers with hinged, single element, miniature cell plastic louvers recessed in a snap-in type T-Bar ceiling system, integrated with heating, air conditioning and acoustical tile panels of the ceiling itself.



For new installation
details ask for Bulletin
No. EC7

SUNBEAM LIGHTING COMPANY
777 East 14th Place, Los Angeles 21, California

MONOTUBE TAPERED STEEL AND ALUMINUM FLOODLIGHTING POLES



Typical Monotube stadium installation.



Monotubes for recreational areas.

**Send for a copy of
Catalog No. 87, today!**

Address

THE UNION METAL MANUFACTURING COMPANY
Canton 5, Ohio



UNION METAL

Monotube Floodlighting Poles

department, on systems having a grounded neutral or having one side grounded, and where the grounded conductor is identified and properly connected, 2-wire branch circuits may be protected by a fuse in the ungrounded wire, no fuse being placed in the grounded wire. Otherwise, 2-wire branch circuits shall be protected by a fuse in each wire."

In the 1925 edition of the Code, Section 807-b was amended so that it was no longer necessary to obtain permission from the inspection department to have single pole protection on a 2-wire grounded circuit properly identified and connected. This rule also eliminated reference to 2-wire circuits and specifically required that when the grounded conductor of a branch circuit was identified and properly connected, fuse protection in the grounded conductor was prohibited. This specific rule, however, recognized an exception as follows: "In locations where the conditions of grounding or the liability of the reversal of connections warrant, the inspection department may require, on systems having a grounded neutral or having one side grounded, that both wires of 2-wire branch circuits shall be fused, even though the grounded conductor is identified and properly connected." This exception first appeared in the 1925 Code and it is similar to the one now covered by Section 2409-b of the 1956 Code. These provisions remained unchanged until the 1933 Code and it should be noted that polarity identification was not required until 1933.

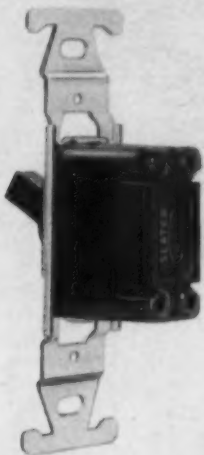
Polarity identification of system and circuits, as a definite Code requirement, first appeared in the 1933 Code under Article 20 covering Wiring Installation Design. In the 1937 Code, Polarity Identification was recognized as an individual Article, No. 200, the same as now recognized in the 1956 Code. Polarity identification requires the grounded conductor to be finished to show a white or natural-gray color and such conductors must be connected to the screw-shell of lampholders.

This brief sketch and review of the rules which form the background of our present Code requirements indicate that back in the days previous to 1920, a 2-wire branch circuit was required to have overcurrent protection in both the live and the grounded conductors; and in 1920 a fuse in the grounded conductor of a 3-wire circuit was prohibited. With the development

QUIET *as a...*



15 AMP — 120 VOLTS — 277 VOLTS
AC ONLY

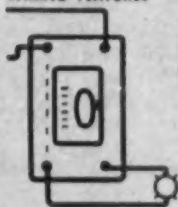


20 AMP — 120 VOLTS — 277 VOLTS
AC ONLY

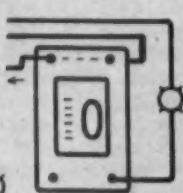


NEW! SLATER A.C. QUIET SWITCHES

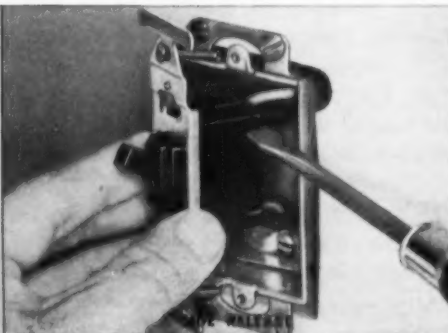
WIRING FEATURES



THRU-WIRE SYSTEM
CATALOG NO. 601



LINE SHUNT
CATALOG NO. 605



LOADED WITH FEATURES

- NEW TYPE, "PLUS" SERVICE, SILVER CONTACTS
- THRU-WIRE SYSTEM OR BUILT-IN SHUNT
- "SPEEDWIRE" REAR WIRING OR SCREW TERMINALS
- EXCLUSIVE SIDE RELEASE; (Patented)
- OPERATES IN ANY POSITION
- EXTRA NEOPRENE BUMPERS FOR SILENCE

EASY to install • SIMPLE to remove • NO call backs

Available in single pole, double pole, 3-way and 4-way with ivory or brown feather-touch toggle, Slater's brand new line of ultra reliable quiet switches provide smooth, noiseless operation. Rated 15 amperes, 120 and 277 volts and 20 amperes, 120 and 277 volts. Slater quiet switches are made to serve your job re-

quirements with perfect performance.

Slater A.C. Quiet Switches are easy to install. Next time save time, money and effort. Ask your electrical wholesaler for Slater Quiet switches with "speed wire" rear wiring and exclusive side release feature or with screw terminals.



SEND FOR
CATALOG #35

SAY
SLATER
WITH
CONFIDENCE

Slater
Lifetime Wiring Devices

SLATER ELECTRIC & MANUFACTURING CO., INC. GLEN COVE, NEW YORK.

Supermarket spans years of construction progress ... **USES Ramset®!**



Ramset System
saves \$10,000 and
two months' time
for new Ft. Wayne
Supermarket



Using the latest construction methods, contractors completed Eavey's Supermarket in Fort Wayne, Indiana, ahead of schedule and ahead of budget!

The electrical contractor reported hanging 10,000 feet of conduit carrying 350,000 feet of wire, with RAMSET, using 100,000 fasteners for the job. About \$10,000 and two full months were saved by using speedy RAMSET SYSTEM, according to George Clement, service engineer for Eavey's. Other contractors saved in the same way.

companion tool

Shure-Set
TRADEMARK

Babybrother to RAMSET, this hammer-in tool uses no cartridge, but makes your own hammer power more effective. For masonry, mortar joints, cinder block. Ask for literature.

RAMSET FASTENING SYSTEM can be used in a variety of ways on most jobs: electrical, plumbing, air conditioning, door, window and wall installations. Moreover, RAMSET is just as valuable in the plant maintenance operation as to the original builders and contractors.

You can anchor almost anything to concrete and steel with RAMSET. New catalog is ready, send for your copy now.

Ramset Fastening System

WINCHESTER-WESTERN DIVISION
OLIN MATHIESON CHEMICAL CORPORATION

12105-B BERE A ROAD

CLEVELAND 11, OHIO

of the polarity identification of systems and circuits the Code prohibited placing an overcurrent device in the grounded conductor of any type of branch circuit subject to two exceptions which were similar to those covered by Section 2409-a-b of the 1956 Code.

Previous to 1940 the status of existing unpolarized installations with respect to fusing was not distinctly covered by the Code. Section 2409-c of 1940 Code clarified such questions as follows:

"In existing unpolarized installations the conductors of 2-wire branch circuits shall have an overcurrent device in each conductor, unless all lampholders have the grounded conductor connected to the screw shell." This was the period when considerable rewiring was undertaken. Schools, stores, etc., were being rewired with new services, feeders and panelboards and the old branch circuits connected to same. Some installations were changed from single phase to 3-phase, 4-wire wye. Panelboards were designed for single-pole fused branch circuits and it was difficult to obtain a double-pole fused panelboard. At that time, in view of Section 2409-c, inspectors would not permit the use of single-pole fused branch circuit panelboards unless the ground wire of an unpolarized circuit was brought to the screw shell of the socket.

Section 2409-c however was short-lived, since the 1946 Code entirely deleted this provision with the following comment: "It was the consensus of the Electrical Committee that no hazard would be created by single-pole fusing in an unpolarized installation, so long as the fuse-holders are always in the ungrounded conductors."

In line with this 1946 deletion, inspectors in general accepted the opinion expressed by the Electrical Committee and no longer required the connection of the grounded conductor to the screw-shell of the socket when existing unpolarized circuits were connected to single-pole fused panelboards.

In 1956, Section 2409-b was deleted entirely.

In view of the foregoing, it appears to me that the procedure followed in "X" County satisfies Code provisions, and the procedure in "Y" County exceeds the present provisions of the Code. Insofar as Section 2409-b was concerned, I believe the foregoing comment given by the Electrical Committee indicates that it did not concern the question.—B.A.McD.



LINE VOLTAGE DROPS TO 80V ON SOLA CONSTANT-WATTAGE BALLASTED INSTALLATION: "Outages" are prevented due to the patented constant wattage circuit in Sola Mercury Vapor Lamp Transformers. Even when line voltage drops as low as about 75v on a 115v line, lamps stay lit, eliminating the need for "auxiliary" incandescent or fluorescent lighting installations.



LINE VOLTAGE DROPS TO 80V ON CONVENTIONALLY-BALLASTED INSTALLATION: Line voltage drops often cause outages. Until lamps return to strikeable condition, vital minutes of production time may be lost in industrial installations; safety hazards may exist in parking lots (as shown above) or playgrounds or plant area protection applications.

Sola Constant Wattage Transformers For E-HI 400w Mercury Vapor Lamps End Outages Due to Line Voltage Drops

When your mercury vapor lighting installation is ballasted with Sola Mercury Vapor Lamp Transformers, you can rely on dependably-maintained light output. First, outages are virtually eliminated since primary voltage must drop below about 75v on a 115v line before lamps extinguish. Second, the Sola Patented Constant Wattage Principle assures lumen regulation within $\pm 2\frac{1}{2}\%$, even in the face of line voltage variations as great as $\pm 13\%$.

In addition, Sola Constant Wattage Mercury Vapor Lamp Transformers offer the following advantages over conventional ballasts:

- Eliminate the need for primary taps . . . positive starting within the primary ranges of 100 to 130 and 200 to 260 volts.
- Low starting current surge . . . line current during

starting interval limited to effectively no more than normal full load value.

- Open and short-circuit protection . . . primary current positively limited under abnormal operating conditions of lamp failure, or external short circuit . . . constant wattage circuit eliminates any lamp electrode rectification.
- Extended lamp life . . . regulated voltage, current, and wattage permit continuous, stable operation, resulting in superior lamp life.
- Low crest factor . . . (peak/rms ratio) of lamp current averages only 1.7 at 115v primary supply.

It will pay you to investigate the advantages of Sola-ballasted mercury vapor lighting installations for both indoor and outdoor high intensity lighting applications. Request your Sola representative to call.

SOLA *Mercury Vapor Lamp*
TRANSFORMERS



Write on your letterhead
for Bulletin 17B-MV-219.

CONSTANT VOLTAGE TRANSFORMERS • FLUORESCENT LIGHTING BALLASTS • MERCURY VAPOR LIGHTING TRANSFORMERS
SOLA ELECTRIC CO., 4633 West 16th Street, Chicago 50, Illinois, Bishop 2-1414 • NEW YORK 35; 103 E. 125th St., Trufolgar 6-6464
PHILADELPHIA: Commercial Trust Bldg., Rittenhouse 6-4988 • BOSTON: 272 Centre Street, Newton 58, Mass., Bigelow 4-3354 • CLEVELAND 15;
1836 Byrd Ave., Prospect 1-6400 • KANSAS CITY 2, MO.: 406 W. 34th St., Jefferson 4382 • LOS ANGELES 23; 3138 E. Olympic Blvd., Angelus
9-9431 • SOLA ELECTRIC (CANADA) LTD., TORONTO 17, ONTARIO: 102 Laird Drive, Mayfair 4554 • Representatives in Other Principal Cities



Extra "Muscles" to Make Tough Fishing Jobs Easier and Faster



FISH TAPE, REEL and PULLER



Standby of electricians for close to a generation, IDEAL Fish Tape, Reels and Pullers can help you do any wiring job faster and easier. They're like an extra arm or bigger muscles—make pulling easier and safer. The reel gives you the leverage you need — and keeps the tape always in the reel or conduit. The tape can't spring loose into moving machinery or "hot" lines.

You reel in and pull the tape through conduit in one easy operation . . . no skinned fingers—no cuts—and no lost time! The tape never gets snarled.

Saves work—saves time—saves money! The IDEAL Fish Tape Reel and Puller costs so little you can't afford to be without it! 50 to 200 foot lengths—all tapes are of finest grade, oil tempered flat spring steel.

Now Step Up the Performance of Your
IDEAL Fish Tape, Reel and Puller with the

NEW **IDEAL** FISH TAPE WINDER

Makes IDEAL Fish Tape Reel Even More Useful

Reduces still further the work of fish tape pulling when used with an IDEAL Fish Tape Reel. As Winder is pulled around Reel it spreads the Reel housing so that the tape can be reeled in or out with least effort. Double rollers hold Winder in place as handle is rotated. Three sizes for all IDEAL Reels.

SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS
In Canada: Irving Smith, Ltd., Montreal



IDEAL INDUSTRIES, INC.
1041-B Park Avenue, Sycamore, Illinois

Please send catalog data on IDEAL Fish Tapes, Reels and Pullers and Fish Tape Winders.

Name _____

Address _____

Company _____

City _____ Zone _____ State _____



Service Entrance Conductor Size

Q. Article 2304a states that service conductors shall not be smaller than No. 6 except for installations consisting of not more than two 2-wire circuits. Would this eliminate a 3-wire No. 8 service for four circuits?

We require at least three circuits in residences, one for ceiling lights, one for base outlets and one for appliances. Could a residential service be installed consisting of three No. 8 wires?—J.H.

A. It should be noted that 2304a2 gives the local inspection authority some leeway in applying this rule. For example, you have a development involving some very small homes that would be amply served by four 2-wire branch circuits—in fact there would be, as in your case, possibly one spare circuit.

It would seem feasible to permit a 3-wire No. 8 for this service. A No. 8 Type R would have 40-amp rating, so with two 20-amp circuits per phase leg we would not overload this service with four, 2-wire branch circuits (or for that matter with two, 3-wire 20-amp multiwire branch circuits).

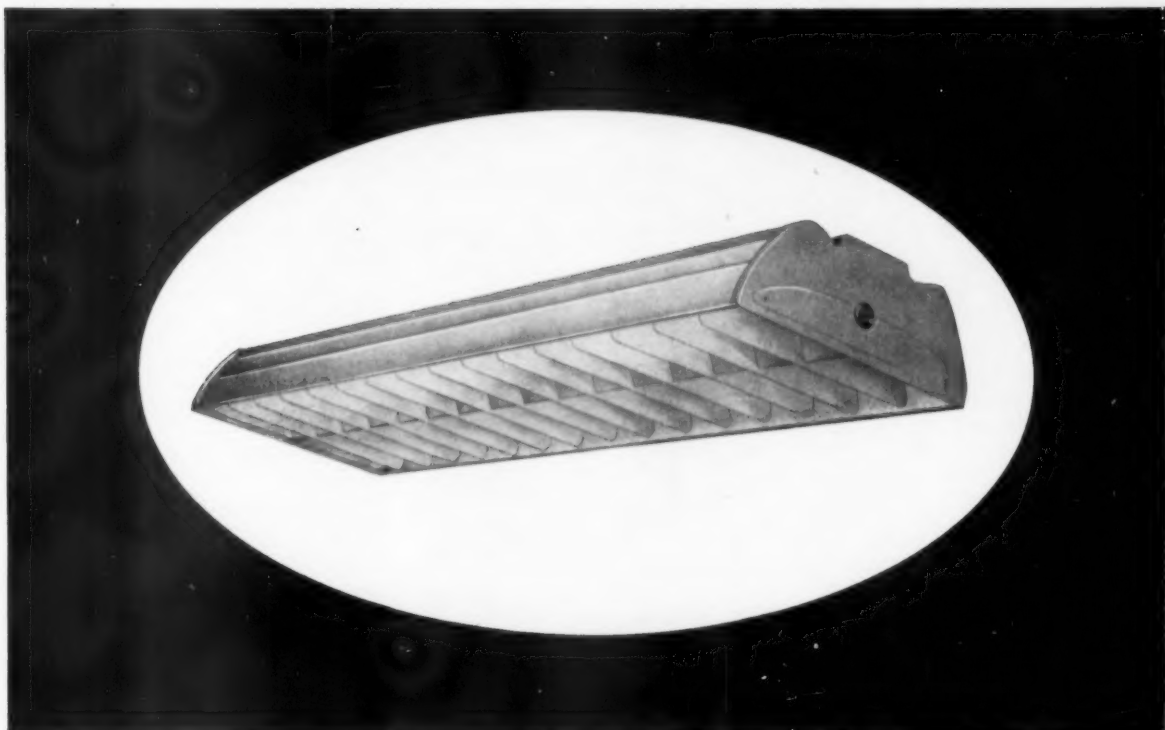
Section 2403a3 also permits a smaller service, but this exception is not usually applicable to residential occupancies.—B.Z.S.

Running Protection For a Motor

Q. Is it true that the National Electrical Code now requires running protection on a 1-hp single phase 115-volt electric motor driving a wood or metalworking tool?—M.J.W.

A. If the tool is other than the portable type, the 1956 National Electrical Code will require running protection for the motor. This new change will be found in the last sentence of paragraph b of Section 4322, which states that a motor of one horsepower or less which is not portable shall be protected in accordance with Section 4322 c. Then under paragraph c of Section 4322 you will find four provisions which read as follows:

"1. A separate overcurrent device which is responsive to motor current. This device shall be rated



ALL-WAYS BEST!

Curtis 4060 series luminaires

BEST ILLUMINATION—low brightness of the Forty-Sixty blends with the illuminated ceiling, producing high levels of quality illumination.

BEST DOLLAR-VALUE—you may pay a little more, but you'll never get more, and there's 116 different luminaires to choose from.

BEST QUALITY MATERIALS—highest purity aluminum or heavy gauge steel for maximum uniformity and durability.

BEST SKILLED CRAFTSMENSHIP—built to closest tolerances for rugged, neat construction and greatest customer satisfaction.

BEST GUARANTEED FINISHES—Alzak aluminum or baked white Fluracite enamel on steel—both are fully guaranteed under standard service conditions and proper use.

BEST TO INSTALL—the continuously grooved Forty-Sixty Series wire channel makes hanger placement flexible to job conditions when patented Curtis "Tong" hangers are used.

BEST PROFITS—because Curtis Forty-Sixty Series luminaires give your customers the best dollar-value, quality materials, skilled craftsmanship, and guaranteed finishes, you get satisfied customers and more repeat business, plus easiest on-the-job installation with minimum service costs. So buy the only complete, all-purpose line of luminaires that's always best, get Curtis Forty-Sixty Series luminaires.

CURTIS LIGHTING, INCORPORATED

6135 W. 65th St., Chicago 38, Illinois

in California:
242 S. Anderson St.
Los Angeles 33, California

in Canada:
195 Wickstead Ave.
Toronto 17, Canada



Curtis Lighting, Inc., Dept. F4, 6135 W. 65th St., Chicago 38, Illinois
Send complete specifications on entire Curtis Forty-Sixty Series luminaires to

Name

Affiliation

Address

City Zone State



When floods come up and power lines go down... this sewage pump keeps pumping

Flash floods are a constant threat to the San Marcos (Texas) sewage system. On occasions, flood waters flow 15 feet deep over the underground sewage pump. In addition, the floods sometimes interrupt electric power to the pump.

San Marcos' city officials solved both these problems with the installation shown above. The concrete structure bars flood waters from the sewage pump and it also serves as a mounting for the Onan Emergency Electric Plant safely above the reach of flood waters. When power is interrupted, the 50KW Onan Electric Plant takes over the power load . . . supplying current for the sewage pump and other essential uses.

Wherever an essential municipal service depends on uninterrupted electric light or power . . . sewage and water systems, police and fire departments, or civil defense organizations, you can depend on Onan Emergency Electric Plants to keep these services functioning. Available from 500 to 75,000 watts.

ONAN PORTABLE ELECTRIC PLANTS SAVE TIME AND MONEY



You get jobs done in a fraction of the time when you can use fast-working power equipment in place of hand tools. Onan Portable Plants give you plug-in electricity anywhere, anytime. Onan 4-cycle plants feature split-second starting, long-life and dependability . . . with light weight.

Dolly-mounted plant shown is from the 205AJ series . . . 2,500 watts.

Specific information available on every model for every use. Let us know your particular problem and we'll supply the information you need.



D. W. ONAN & SONS INC.

2911 University Ave. S.E., Minneapolis 14, Minnesota

or set at not more than 125% of the motor full-load current rating for motors marked to have a temperature rise not over 40 degrees C, and at not more than 115% for all other types of motors. For other than sealed refrigeration compressor motors this value may be modified as permitted by section 4324.

"2. A thermal protector integral with the motor approved for use with the motor which it protects on the basis that it will prevent dangerous overheating of the motor due to overload or failure to start. If the motor current-interrupting device is separate from the motor and its control circuit is operated by a protective device integral with the motor, it must be so arranged that the opening of the control circuit will result in interruption of current to the motor.

"3. If part of an approved assembly which does not normally subject the motor to overloads and which is also equipped with other safety controls which protect the motor against damage due to stalled rotor current. Where such protective equipment is used, it shall be indicated on the name-plate of the assembly where it will be visible after installation.

"4. If the impedance of the motor windings is sufficient to prevent overheating due to failure to start, the motor may be protected as specified in paragraph b for manually started motors."

It therefore becomes necessary for the inspection authority having jurisdiction in the area when enforcing this provision of the Code to determine whether or not the device operated by the motor is to be considered as portable. At the present time the National Electrical Code does not define a portable device, but I believe you will find that most inspection authorities define such a device or appliance as one which is used in more than a single location. In other words, if in the normal use of an appliance it is moved from one location to another, it is safe to assume it is a portable appliance. It is my personal opinion that as most metal or woodworking machines of other than the hand tool variety normally set in a fixed location, they would be deemed as other than portable appliances, making it necessary to provide running protection for their manually started motors.—G.R.



the man from *Smithcraft*

When you put his knowledge of lighting to work for you — in your office or on the job — your profit picture will quickly improve . . . you'll have the installation know-how you need to simplify any lighting job. His experience will help you apply the flexibility of Smithcraft's line of lighting units into time-saving, profitable solutions to lighting problems. Call him in to consult with you . . . you'll find he knows blueprints and budgets as well as he knows lighting!



* Arthur W. Siegel, Massachusetts Representative, one of Smithcraft's nationwide sales organization

Smithcraft Troffers and other fine lighting units are installed in thousands of offices, factories, stores, schools and other types of installations from coast to coast. Wherever good lighting is important, you'll find . . .

SMITHCRAFT—"AMERICA'S FINEST FLUORESCENT LIGHTING."



* . . . the 24" wide troffer from *Smithcraft*

Installation features that reduce costs to rock-bottom! Metro Troffers, 2-foot wide, are simply placed on inverted "T" bars. Templex 2' wide Troffers are placed in opening and factory-attached hangers are automatically positioned on ceiling supporting members. Door frame is hooked on and closed (or opened) by simple upwards pressure. These features mean profitable jobs!

Smithcraft
LIGHTING
CHELSEA 50, MASSACHUSETTS

PLEASE ATTACH TO YOUR BUSINESS LETTERHEAD and mail to

EC-2

Smithcraft LIGHTING, CHELSEA 50, MASS.

NAME _____ TITLE _____

- ☐ Please send me the monthly publication, "Light Side of the News", so that I can keep in touch with the latest trends in lighting.
- ☐ Please send me "YOUR CEILING PLANNING COMES TO LIFE", a complete handbook on one and two-foot wide SMITHCRAFT ARCHITECTURAL TROFFERS.
- ☐ Please send me the complete SMITHCRAFT CATALOG, containing data on America's Finest Fluorescent Equipment.



"Been buying direct again, eh, Willoughby?"

"Electrical Wholesaler Distribution reduces the Manufacturer's selling cost and thereby reduces the selling price of electrical supply material to the user. Therefore, our policy has been to distribute Thomas & Betts products exclusively through the Electrical Wholesaler."*

LOOK FOR THIS SIGN —



IT'S THE MARK OF AN AUTHORIZED **T&B** DISTRIBUTOR

*Quoted from the T & B Plan of Wholesaler Distribution. If you would like to know the complete story of the T & B Plan, write:

THE THOMAS & BETTS CO.

INCORPORATED

34 BUTLER STREET, ELIZABETH 1, NEW JERSEY

THOMAS & BETTS, LTD., MONTREAL, P. Q., CANADA

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

In The News

ETL President Honored

William F. Little, who retired from Electrical Testing Laboratories, Inc. on December 31, 1956, was honored on December 11, when 88 leaders from all branches of the electrical industry paid tribute to him at a reception and banquet held in New York City at the Hotel Lexington.

Toastmaster for the evening was Ward Harrison, consulting engineer and past president of the Illuminating Engineering Society.

Speakers who paid tribute to Mr. Little and recapped his long life in the electrical industry included M. N. Waterman, president of the Illuminating Engineering Society and assistant commercial manager of Westinghouse Lamp Division; Don Blanchard, representing the Society of Automotive Engineers and the American Association of Motor Vehicle Administrators; Hoyt P. Steele, president, RLM Institute and president, Benjamin Electric Manufacturing Co.; and E. D. Stryker, Lamp Division, General Electric Co., Cleveland.

Mr. Little's retirement from ETL came only after 49 years of service with that organization. He joined ETL in 1903, and has been with the firm ever since with the exception of a four-year period (1906-1910) when he was manager of Victor Instrument Co. Mr. Little was elected to the Presidency of ETL in 1953.

During nearly half a century of work with ETL, Mr. Little had many duties and his work covered a broad field. These included general testing in the laboratory, supervisor of all photometric testing, design of apparatus, calibration of standard lamps, and testing of lighting equipment such as fixtures, luminaires, street lights, and illumination tests indoors and out. He also supervised spectroscopy and radiometry test activities.

Mr. Little organized (1919) and participated in much of the pioneer work and testing leading to the preparation of standard specifications for automotive lighting equipment. During World War I he was associated (on loan) directly with Thomas A. Edison in the study of camouflage, and during World War II he was loaned to the Army Engineer Corps at Fort Belvoir, Va.



WILLIAM F. LITTLE (R), President of Electrical Testing Laboratories, Inc., retired December 31 after 50 years association with that firm, and was honored by a reception and banquet at which time a clock was presented to him by friends and associates. Hoffman S. Beagle, executive vice president, ETL, made the presentation.

to assist in "black out" tests and other requirements pertaining to wartime visual and illuminating problems.

Mr. Little has long been active in technical society work, most notably the Illuminating Engineering Society in which he has held all but one of the major elective offices, including that of president. He is both a Fellow and a Medalist in IES. Other societies of which he was an active member include Society of Motion Picture and Television Engineers, American Optical Society, Society of Automotive Engineers, a charter member of Inter Society Color Council, a member of American Society for Testing Materials, American Standards Association, and International Commission on Illumination.

Mr. Little has been granted more than a dozen patents, and was a co-editor of the chapter on "Illumination" in the Standard Handbook for Electrical Engineers. He developed the standards and certification program for the IES Study Lamp which became so popular during the 1930s.

During the testimonial dinner Mr. Little was awarded a certificate making him a Member Emeritus of the Illuminating Engineering Society. He also received from his friends and associates a nautical clock, and a bound collection of letters and telegrams wishing him happiness in his retirement.

\$90-Million Electronic Air Cleaning Business Forecast

By 1962 electronic air cleaning will expand into a \$90-million annual business according to John E. Haines, vice president in charge of Minneapolis-Honeywell Regulator Company's commercial division. He sees in the next five years a potential market of \$70-million in commercial buildings and \$20-million in homes for electronic air cleaners of the type which his company is adding to its line of automatic controls.

Haines disclosed the forecasts at editorial conferences at which the company unveiled a model of its electronic air cleaning equipment which it is beginning to market in February. Haines said Honeywell's estimate was based on expected reductions in the price of units through large-scale manufacturing and distribution.

"The need for clean air has not been sufficiently recognized," Haines said. "It has not been dramatized to us as the problem of water pollution has. Also it has been easy to sell inexpensive devices that will filter air and, because they must be replaced from time to time, we are convinced that they are doing an adequate job. Most heating and air conditioning installations do not actually clean the air."

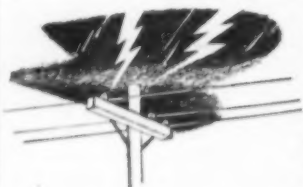
R. H. Jacobs, newly-appointed sales manager for Honeywell's air cleaner division, pointed out that most of the staining power in airborne dirt is in particles that are too small to be effectively handled by ordinary mechanical filters. These particles are less than 1/5,000 of an inch in size. Yet they indirectly account for nearly one-fourth of the total operating cost in a building. This includes the cost of washing windows and walls, painting, losses from soiled merchandise, time spent cleaning typewriters and other office equipment, and damage to delicate machinery, Jacobs said.

Jacobs cited a nationwide study of office buildings which showed that owners spent 57 cents per square foot to keep rental space clean. He said market studies by his own firm disclosed, for example, that a Minneapolis bank building spends \$175,000, including \$12,500

**You have fewer
costly callbacks
with**



The Sangamo Heavy Duty Time Switch is the "no callback" time switch. It's *quality* all the way through—accurate . . . quiet . . . dependable. It's powered by the slow speed Sangamo-built motor that gives extra years of service. Heavy silver contacts and accurate, positive time settings add to the Sangamo reputation for quality.



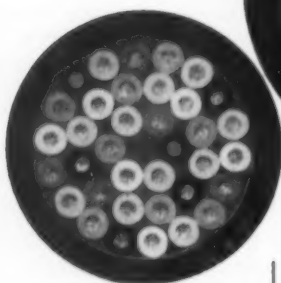
AUTOMATIC CARRYOVER

Only Sangamo offers the electrically wound automatic carryover that keeps your time switch running accurately for up to 10 hours during power failures. No resetting or rewinding is necessary. See these "no callback" switches at your Electrical Wholesaler's today.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

ST57-1

NOW!



**BRONCO 66
CONTROL
CABLES**

WITH UP TO 36 CONDUCTORS

BRONCO 66 CERTIFIED CONTROL CABLES are made with the tough, flexible, oil resistant, Synchro Cured Bronco 66 jacket that is certified to contain not less than 67.32% Neoprene. Jacket is branded every two feet. There are three types of Bronco 66 Certified Control Cable—extra flexible portable cable, shielded portable control cable for electronic circuits, and "stationary" for important control circuits. In the stationary type there is a color coded Neoprene jacket over each single buna rubber insulated conductor.

**WESTERN INSULATED
WIRE CO.**

Los Angeles 58, California

write for
NEW FREE CATALOG CONTAINING
A COMPLETE LISTING OF
BRONCO 66 CERTIFIED CABLES:

WESTERN INSULATED WIRE CO.
Los Angeles 58, California
Please send me your new free catalog
of wires and cables.

Name _____ Title _____
Company _____
Address _____

for washing the inside of windows and \$10,000 a year for washing walls.

The new air cleaner employs electrostatic precipitation. As dust atoms flow into the cleaner, they pass through a 13,000-volt electrostatic "field" where they receive a positive electrical charge. This over-balances the negative charge surrounding the atom and makes it a positive ion.

It is a physical law that like electrical charges repel each other and opposite charges attract each other. The positively-charged ions are, therefore, attracted to negatively-charged collector plates (carrying 6,500 volts of electricity) and are repelled by alternately-placed positive plates in the collector unit.

After being collected on the negative plates, the dust particles are automatically washed away by a water spray.

Electronic air cleaning units are installed in the ductwork of the modern heating, ventilating, and air conditioning system. They are available in various sizes and can be arranged so their air handling capacity exactly matches the air handling capacity of the system fans.

The cleaner has no moving parts. Its electrostatic fields are provided by transformers and high voltage rectifier tubes. Supply requirements are 120 volts, single phase, ac. A typical cell, rated for 1300 cfm, uses about 50 watts.

**Air Conditioning
Growth Predicted**

Retail dollar volume for air conditioning in 1957 is expected to reach new heights in all categories with central residential units approaching the volume of room air conditioners. The picture will look like this:

Room air conditioners	\$440 millions
Self contained equipment	\$238 millions
Residential	\$375 millions
Applied systems	\$1,190 millions
Heat pumps	\$30 millions
Approximately 10% of new single family dwellings started this year will have central air conditioning.	

When 18% of commercial office space in a large city has air conditioning, remaining existing buildings must air condition. The mark has been reached in Chicago

Now-PERMANENT PROTECTION

for Outdoor Convenience Outlets

WEATHERPROOF ALUMINUM • NEVER RUST OR CORRODE



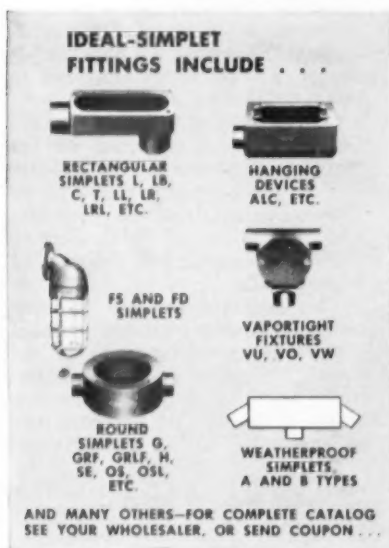
- Lifetime stainless steel spring and hinge pin closure — no fumbling with screw-on lids
- Gasket sealed — water and vapor tight
- For all 2-wire and 3-wire duplex receptacles

Catalog No. 1055 . . . fits FS and FD fittings, gasket and screws included.

Catalog No. 1057 . . . fits steel switch boxes. Gasket and screws included.



DUPLEX OUTDOOR COVERS



Two Styles . . . FOR INDUSTRIAL, COMMERCIAL, INSTITUTIONAL, RESIDENTIAL WORK

Never before available . . . these *new* aluminum Ideal-Simplet Duplex Outdoor Covers are offered to help you provide *permanent* protection for outdoor convenience outlets. A service which can mean more work for you . . . more volume and income. Use Ideal-Simplet Duplex Outdoor Covers with standard Ideal-Simplet FS and FD fittings or steel switch boxes on your next job!

BY THE MAKERS OF THE FITTINGS

WITH THESE OUTSTANDING FEATURES

- Fastest delivery in the industry
- U. L. Approved
- Strong, rugged, durable
- More work area inside
- Screws in corners—no obstructions
- Ground surfaces for tighter seal
- Field service help
- Covers packed with LB, C, E, T, LL, LR, LRL rectangular fittings, if you prefer

ORDER IDEAL-SIMPLET DUPLEX OUTDOOR COVERS AND FITTINGS FROM YOUR WHOLESALE NOW

Pioneers in Conduit Fittings and Electrical Specialties



SIMPLET FITTINGS, Inc.
A Subsidiary of Ideal Industries, Inc.
1041-B Park Avenue, Sycamore, Illinois

WANT MORE FACTS? MAIL COUPON NOW . . .

IDEAL-SIMPLET FITTINGS, INC., 1041-B Park Avenue, Sycamore, Illinois

Send complete Duplex Outdoor Covers data and prices ☐ New catalog ☐

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

LOAD CENTER TRANSFORMERS

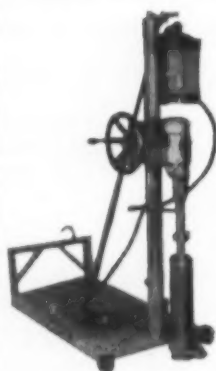
Let Standard Transformer Company engineers help you meet load center problems. We'll work with you to design the transformers required to operate with existing switchgear or with new switchgear. Send us your plans or problems today and let us work out a practical, efficient, and economical solution with you. Write Standard or contact the nearby Standard Transformer Company Representative.



Type HT Askarel filled transformer 500 KVA. three phase, 2400x4800 volts primary, 480Y/277 volts secondary. Equipped with high voltage disconnect and transition panels for fitting with low voltage switchgear section.

Standard[®]
THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO
REPRESENTATIVES IN PRINCIPAL CITIES



MODEL 'E' DRILLS VERTICALLY, HORIZONTALLY OR AT ANY ANGLE

The Pennndrill Model "E" is a complete drilling unit, easily operated by one man, and requiring only 110 volts AC or DC for operation. It drills clean, smooth holes from 1" to 6 1/4" in diameter, up to 19" deep in one operation, through concrete, asphalt, marble, tile and brick; including any reinforcing bars, pipe, conduit, etc., that might be encountered in the hole.

Easily adjustable for drilling holes close to walls and in tight corners.

*The Quick
and
Sure Way*

PENNSYLVANIA DRILLING CO.
Masonry Drill Division
1201 Banksville Rd. Pittsburgh 16, Pa.



to drill MASONRY
including REINFORCED
CONCRETE



and Philadelphia and passed in New York.

These figures were disclosed by Cloud Wampler, Chairman of the Board of Carrier Corporation during the dedication of new engineering and research facilities for the company's Unitary Equipment Division in Syracuse, N. Y. He predicts that total air conditioning and refrigeration industry volume five years hence will be in the neighborhood of \$5 billion.

Feature Contractors At February AW Meet

At least three contractors will be in the spotlight at the National Adequate Wiring Conference, Feb. 21-22 at the Sherman hotel, Chicago.

Oliver F. Burnett, head of Kelso-Burnett Electric Co., Chicago, president of NECA, will speak on "Who Will Fill the Need?" at the 13th annual wiring meeting.

Richard C. Finn, Cambridge Electric Co., Cambridge, Mass. will be one of two leaders illustrating successful wiring sales techniques in a "miniature" Housepower forum course.

Ernest E. Cannon, Cannon & Watson Electric Co., Phoenix, is one of three speakers scheduled to tell the "Arizona Story."

Other featured speakers include Carl Bremicker, chairman of the National Adequate Wiring Bureau, and D. F. Kennedy, president of Edison Electric Institute. Kennedy, who is president of Public Service Co. of Oklahoma, will deliver the keynote talk.

The program for the two-day conference also includes a panel discussion on commercial-institutional wiring, a roundup of national advertising for 1957, and a series of five-minute presentations on successful wiring promotions.

Advance registration may be made through NAWB, 155 E. 44th Street, New York, N. Y. The fee is \$6, payable at the conference.

NISA News

NISA members overwhelmingly approved a revised dues structure, effective April 1, 1957. "This will enable our association to more adequately provide the materials and services required by the independent service and sales indus-



If it's worth Engineers' time . . .

. . . It's worth Engineered Cable

Belden

**INTERCOMMUNICATING
AND
SOUND SYSTEM CABLES**

Indoor-outdoor, phones
or speakers—there is a
Belden engineered cable
to meet your needs for
a permanent, trouble-
free installation.

"Items from the
Complete Belden Line"

*The TV station, the systems for
music, paging, and intercom-
munication in the new
Prudential Insurance Company
of America's Building in Chicago
have been—wired by Belden.*

Belden

**WIREMAKER FOR INDUSTRY
SINCE 1902
CHICAGO**

8-8

Magnet Wire • Lead and Fixture Wire • Power Supply Cords, Cord Sets and Portable Cord • Aircraft Wires
Welding Cable • Electrical Household Cords • Electronic Wires • Automotive Wire and Cable



NEW

Explosion Proof* Roto- Bin- Dicator

FREE ILLUSTRATED CATALOG

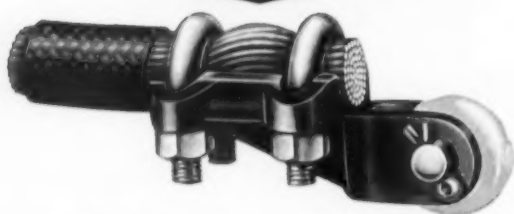
* The first-and-only rotating paddle-type bin level indicator to be tested and listed by Underwriters' Laboratories for use in Hazardous Atmospheres, Class I, Groups C & D, Class II, Groups E, F & G. Especially for use in bins under pressure or vacuum. Flexible spring shaft permits use with large, lumpy or abrasive materials. Can be mounted at any angle.

THE BIN-DICATOR COMPANY

13946-12 Kercheval • Valley 2-6952 • Detroit 15, Michigan
SPECIALISTS IN BIN LEVEL CONTROL FOR OVER 20 YEARS

WE SELL DIRECT • PHONE ORDERS COLLECT

LOCK CABLE SAFELY, SECURELY with— "EFFICIENCY" Cable Strain Clamps without Strain or Damage



... Withstands direct pull of 17,000 pounds

Efficiency Cable Strain Clamps lock cable safely and securely without possible strain or damage. "H" construction of clamps and high ridge across center of cable prevents

cable from slipping. Takes cable from 1/8 to 1,500,000 c. m. Three clamp sizes cover all cables sizes. Furnished with eye or clevis, for AC or DC Service.

Write for Catalog 38-A

"EFFICIENCY" DEVICES for CONDUIT and CABLE SUSPENSION

Efficiency

ELECTRIC AND MANUFACTURING CO.
EAST PALESTINE, OHIO

MANUFACTURERS OF EFFICIENCY
ELECTRICAL DEVICES FOR CONDUIT
AND WIRE CABLE SUSPENSION

try," executive vice-president Fred. B. Wipperman said.

"Executive vice-president" is the new title of NISA's chief executive officer, the change having been made by the membership in a mail ballot in January. The new title, it was felt by the NISA board of directors, is more in keeping with the duties and character of the position. Mr. Wipperman's newly-appointed assistant, Joseph M. Harrington, will be known as "assistant to the executive vice-president."

Harrington's duties during the first few months of this year will include considerable travel, particularly in areas where there has been interest in further chapter development. The personable young attorney, whose career already includes more than ten years in association activity, launched his visitation program early in January by speaking before three NISA chapters in as many days. In Chicago he addressed 150 members of Central District Chapter on January 8. The following night he spoke before 30 members of Greater St. Louis Chapter. The next day he addressed 40 members of King Coal Chapter in Centralia, Ill.

The January meeting of NISA's Central District (Chicago) Chapter was the second annual installation of new officers conducted by the national president of the association. Charles J. Covington installed the following new officers: Abe Marcus of Ther Electric & Machinery Co. (president), Bernard Ferrari Jr. of Excel Electric Service Co. (vice-president), William C. Luebker of Myre Electric Co. (secretary) and Leroy Nettgen of Arthur Wagner Co. (treasurer).

William J. Billings of Ebling Electric Co. and Clarence Sievert of Sievert Electric Co., both Chicago, were named to the board of directors of the chapter. Other incumbent directors remaining in office are: H. W. Reeve of Inland Industrial Electric Service Co., Sigmund Pluskota of Pluskota Electric Co., Martin R. Steck of Roberts-Stage Electric Co., all Chicago, and John P. Wynant of Wynant Electric Service, Pontiac, Ill.

At the Greater St. Louis Chapter meeting January 9 Elbert F. Niebruegge of Hopcroft Electric, Edwardsville, Ill., was elected president. His fellow officers include: Vice-president, Jerald

Schaeffer of Schaeffer Electric, secretary-treasurer, Jim Adams of Quality Electric, both St. Louis, and directors, Charles C. French, French-Gerleman Electric Co., and Joseph Cavataio of Illinois Electric Works, East St. Louis, Ill.

Charles C. French was also awarded a service plaque by the national organization for his service as national president in 1943-44 as well as his many other efforts in behalf of NISA, including four general convention chairmanships, the national vice-presidency, secretaryship and treasurer, and the chairmanship of numerous committees, including trade relations and engineer's advisory, as well as his work in launching NISA News. President Covington made the award.

At the meeting of King Coal Chapter, Frank Flanders of Flanders Electric Motor Service, Evansville, Ind., and Rex Woodward of Dowzer Electric and Machinery Works, Mount Vernon, Ill., were named to the board of directors. The chapter watched a motion picture produced by Crucible Steel Corp. and toured the factory of Hollywood Candy Co. during the Centralia meeting. Klein Armature Works was also visited.

NISA's new hospital-medical-surgical program became effective Jan. 1. The new insurance plan supplements the group life insurance program which was introduced to NISA members in 1955. Members may buy either or both policies. The program is underwritten by New York Life.

Rewiring Profits Follow Strong Sales Effort

"When you find there's more profits per hour in selling than in 'doing,' concentrate on selling," advises Robert Keough, owner of Robert Keough & Co., Philadelphia. "That's how residential rewiring is with us."

The Keough firm now gets over 65% of its contracting volume from home rewiring. The number of electricians and trucks used by the firm have doubled since 1950, when rewiring became a major sales development effort. "The gross and net profits have gone up accordingly," Keough adds.

ONLY ELECTROMODE Offers so much! in Automatic ELECTRIC HEAT



ALL YOUR REQUIREMENTS FROM ONE RELIABLE SOURCE
COMPLETE OR SUPPLEMENTARY HEAT

FOR HOME

✓ BASEBOARD HEATERS

Low-Level Perimeter Heat

✓ WALL-TYPE AND PORTABLE

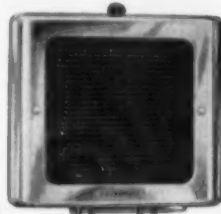
Fan-Circulating Models

✓ PANEL HEATERS

Radiant Convection

✓ RADIANT CABLE HEAT

WALL MODEL
For bathroom or
small room.



FOR INDUSTRY

✓ SUSPENSION-TYPE

✓ PORTABLE AND SUSPENSION

✓ EXPLOSION-PROOF

SUSPENSION-TYPE
Solves hard-to-heat areas
in the plant and isolated
locations.



ONLY ELECTROMODE has the SAFETY-GRID

a completely sealed-in CAST ALUMINUM HEATING ELEMENT. All electric wires are insulated and embedded within this finned aluminum casting. Absolutely no exposed hot wires or glowing coils, and no danger of fire, shock or burn. It's the greatest feature any electric heater ever had and it is guaranteed for five years.

Around The FARM . . .

✓ MILK HOUSE HEATERS

✓ PUMP HOUSE HEATERS

MILK HOUSE HEATER
Also useful for brooder pens, fruit
and vegetable bins, etc.



ELECTROMODE INSTALLATIONS BENEFIT CONTRACTOR AND USER

- Full Range of Designs and Sizes for every need.
- Automatic Room Temperature Control.
- Quality Line—Made by Experienced Manufacturer.
- No Call Backs—No Servicing—No Adjustments.
- Easy to Install—Saves Time and Labor.
- Profitable Line to Handle.

ELECTROMODE

Division Of
COMMERCIAL CONTROLS CORPORATION

Dept. EC-27, 45 Crouch St., Rochester 3, N. Y.

Please send FREE Electric Heating File, containing specifications, illustrations, installations, prices and how to figure electric space heating. We are interested in:

☐ Home and Office Heaters ☐ Industrial Unit Heaters ☐ Farm Heaters

Name _____

Address _____

City _____

Zone _____

State _____



made only by ...

CONDUIT PIPE PRODUCTS CO., COLUMBUS, OHIO

SOLD ONLY THROUGH RECOGNIZED WHOLESALERS

WADSWORTH

New

"E-Z-RED" CIRCUIT BREAKERS
12 - 16 OR 20 BRANCH CIRCUITS
SINGLE AND/OR DOUBLE POLE



100 AMP.
FUSIBLE MAIN DISCONNECT
FOR "E-Z-RED" (15 TO 50 AMP.)
CIRCUIT BREAKER BRANCH CIRCUITS

*for Range, Dryer, Lights, Washer,
Appliances, Water Heater,
Heating Panels,
Air Conditioner, etc.*

200 AMP. FUSIBLE MAIN ADEQUATE WIRING for today and tomorrow!



SERVICE ENTRANCE
MAIN SWITCH DOOR OPERATED

*for Range, Dryer, Water Heater
and Sub Feeds.*

Plug Fuse Receptacles can be used for
240 Volt Heater Circuits or 125 Volt
Lighting and Appliance Circuits.

The WADSWORTH Electric Mfg. Co. Inc.
Covington, Kentucky

WRITE FOR FREE CATALOG

He traces this growth to hard work, plus the reputation, contacts and experience that time alone can provide. But he gives much credit to the national rewiring-electrical living programs and to their local sponsors, the Philadelphia Electric Co. and the Electrical Association of Philadelphia. Figuring that there's always more to learn, he recently took the Housepower sales training course run by the utility and association.

"The big thing, though, that these programs have done," Keough says, "is to change the consumer's thinking. Now they talk about electrical systems the same way they've been talking plumbing. Housepower, Live Better Electrically, 100-A, which is the Philadelphia program. They rattle these terms right off—and that makes our sales job easier."

He cites a recent job as an example. The owner of a 35-year-old house had been referred to Keough by the utility. The house had a one-fuse system and, in addition to being heavily overloaded, had some specific trouble spots. Keough concentrated on the problems of the system rather than the specific difficulties, and wound up selling a complete \$435 rewiring job.

"Ordinarily, I'm afraid that would have gone as a \$40 service job," Keough says. "That's true even today, unfortunately. Too many contractors are scared of rewiring. It's a field where we could use some competition."

Keough switched to rewiring from contract residential service work in 1950, and claims to have done a steadily increasing business ever since. His first year in the field was a good one, for he won the Electrical Association's rewiring contest and took home a contest check for \$2425 for 220 new services and other work.

At that time, he had seven electricians and three trucks. Now he has 14 men, operates five trucks and hires a rewiring estimator. "I doubt if we'll ever run out of business," he adds.

Prospects come from four main sources. One is word-of-mouth, or what Keough calls "next-door jobs." They are developed on the job or by reference from a satisfied customer. Another is utility leads, most of which derive from the Philadelphia 100-A program and from normal service calls. The third source, a telephone book classified advertising section is also fruitful.

Keough's fourth method is off-beat but effective. Through direct

mail, he has offered to take rewiring prospects off the hands of other contractors. "We often get the jobs they turn down because they're busy or because they're not geared to handle them," Keough says. "We get enough work this way to pay for the mailings and for the commissions."

Keough still relies heavily on complaint calls for his active leads. The electrician sent out on the call looks over the wiring system, then discusses the situation with the owner or housewife. He plants the seed for the sale, Keough says, and if there's a positive reaction, the firm's estimator makes a follow-up call.

Keough says that fast action is essential, since the first contractor often gets the rewiring job. That's why he scatters, if possible, his trucks around the city during the day. If there's a service call, he contacts the nearest truck and they in turn make the home call. "We usually make it within an hour," he concludes.

Keough feels strongly that more contractors should be doing rewiring work. "The jobs are unlimited, and the profits are good. Right now, too, the 'suede shoe' boys are moving in here with their home improvement rackets. I know that contractors can do far better work at less cost to the homeowner, and I hate to see these jobs being stolen. They're our business."

NYECA Officers Elected for '57

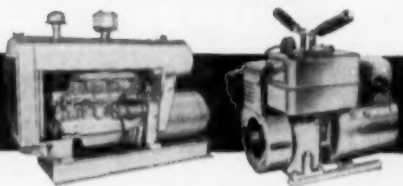
At the annual meeting of the New York Electrical Contractors Association, Inc., held January 10, the following officers were elected to serve for this year: Samuel W. Hurowitz, president; John Doris, vice president; George F. Price, treasurer; and John J. Morrissey, secretary. The Executive Committee consists of A. Lincoln Bush, H. F. Fischbach, John W. Frommer, E. A. Kahn, Frederick Latzer, William Leibfried, Sidney P. Lipkins, L. C. MacNutt, Henry C. Parke, J. M. Watters, Jr., and Harold A. Webster.

At the same time the following chairmen of committees were appointed: Membership, M. S. Blumberg; Legislative, J. W. Werther; Constitution and By-Laws, John P. Morrissey; Trade Jurisdictional, John W. Frommer; and representative on Board of Governors, NECA, Harold A. Webster.

SELL AND USE . . .

UNIVERSAL ELECTRIC POWER AND LIGHT PLANTS

YOU PROFIT
2 WAYS!



1. Tap the big emergency power plant market with the Universal line . . . supply householders, businesses, institutions, etc. Universal offers you more—in suitable models, fast deliveries, low, easy-selling prices. Air- and water-cooled models, gasoline or diesel powered, from 250 watts to 35 kw.

2. Profit from instant on-the-job power! Avoid problems and delays of hooking into regular service. Lightweight, low-cost Universal models to handle all your power tool needs anywhere you go!

FREE NEW FOLD-OUT GUIDE!



All the information, specifications, pictures on Universal air-cooled models at your finger tips. Ask for helpful Bulletin FSE-2; also other gasoline, diesel literature. Write Universal Motor Co., 438 Universal Drive, Oshkosh, Wis.



"BUFFALO" SKY-VENT(R) POWER ROOF VENTILATORS

NOW! EFFICIENT PACKAGE ROOF FANS FOR EASY INSTALLATION!

Yes, complete units with motor, fan, housing, weather hood, dampers and integrally welded roof curbing—ready to install! "Buffalo" Sky-Vents(R) are ideal for your roof exhaust jobs in the wide capacity range from 1000 to 250,000 cfm. Available in Style "H" (illustrated) or cylindrical vertical discharge Style "V", both of typical heavy-duty "Buffalo" construction with efficient "Buffalo" Propeller or Axial Flow Fan. Write for Bulletin FM-2245 and prices on these popular new fans.

BUFFALO FORGE COMPANY

520 Broadway

Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities



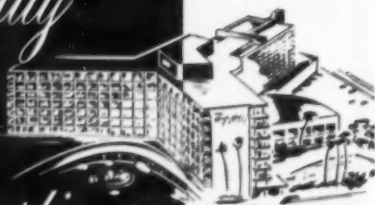
INDUSTRIAL EXHAUSTERS — BELTED VENT SETS — PROPELLER FANS — "E" BLOWERS — EXHAUSTERS

FOR

Quality

WITHOUT

Question



The Beverly Hilton uses only the finest, from champagne to transformers.



450 KVA, three phase, dry type transformer. Primary 480 Secondary 208Y/120, 4-2 1/2% FCBN

The fabulous Beverly Hilton has installed Marcus Transformers with a total capacity of approximately 2000 KVA. This guarantees them complete dependability and uninterrupted, trouble-free service for their power and lighting distribution.

A complete line of dry and liquid-filled transformers up to 5000 KVA.

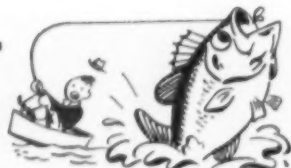
Representatives in Principal Cities



"Mark of Quality"

Marcus TRANSFORMER CO., Inc.,
RAHWAY, NEW JERSEY

Need



OVERLOAD PROTECTION?

Here's what Pierce Renewable Fuses offer you:

- Positive protection to equipment
- Freedom from unnecessary blows
- Link replacement in a few seconds
- Far less maintenance and downtime
- Safety from dangerous afterblows
- Cooler operation — 6 to 8 times longer fuse life

We invite you to compare the unique construction of Pierce Fuses with any other good make—to check their strong tubular bridge that assures proper link contact and knife alignment—their screen vented design that prevents temperature buildup—their link replacement that requires only a screwdriver. For convenience, for peace of mind, for lower downtime and fuse costs, no fuse offers you so much as Pierce!

MAIL COUPON TODAY

PIERCE RENEWABLE FUSES, INC., Leicester, N. Y.

I would like to see and compare one of your Balanced Lag Pierce Fuses:

() Knife Blade Type () Ferrule Type

Name

Company

Address

City State



Wholesalers to Push Contractor Sales Aids

Contractors are due to get a co-operative nudge from distributors on local participation in the Housepower and Adequate Wiring programs.

Joint distributor-contractor efforts on wiring promotions is the main goal of a new 10-part promotion package recently made available to members by the National Association of Electrical Distributors. It consists of promotion tools and a planning guide which explains (1) why a distributor should tie-in to these programs and (2) how he can help contractors tie-in to, and profit from, them.

"Contractors and distributors must work together to expand the home wiring market," explained Arthur W. Hooper, executive director of NAED. "Many distributors feel that the contractor isn't closely associated in the public mind with rewiring work. They hope to encourage greater identity by working with and encouraging action by their contractor customers."

Hooper emphasized that NAED's promotion kit was designed not to create new tools but to bring together existing tools and organize them so that distributors and contractors can make full use of them.

Rewiring Planning Vital, Chicago Firm Stresses

Turning a residential rewiring lead into a sale—at a profit—takes careful planning of time and effort by the contractor.

"We find that these sales average less than \$150," Ernest Jensen, Service Electric Co., told Chicago's Business Building Conference for contractors. "The actual cost of selling and the effort of selling can get out of hand very quickly."

Service Electric's three-step plans begin with a telephone contact. The customer is asked his wiring problems, age of home and type of fuse box or wiring, and is then quoted an approximate price.

The second step is the personal call. An estimate and detailed contract are drawn up, and there is an emphasis on the extra benefits rewiring can furnish. Since there's normally a follow-up call, there is enough time to sell-up the job.

Service regards the third step—a quick closing—as vital. "Otherwise, the proposed job will become a project," Jensen says.

OUTLET BOXES & COVERS are our BUSINESS!



It is also our business to keep daily pace with the contractor's complex wiring problems. The result is our modern line, geared to your current needs. For example:

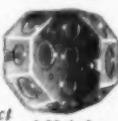
1 Box Does the Job of 3!

ARROW

4" OCTAGON OUTLET BOX

2 1/4" Deep

Means Compact
Versatile Stock!



Full 4" wide box has 8 side knockouts . . . **FOUR** 1/2" and **FOUR** 3/4" sizes (plus reg. 5 bottom K.O.'s). Gives 23.5 cu. in. wiring space . . . *more than any other 4" octagon box.* 4-00-A box replaces these three:

- 54171-1/2 . . .
—with four 1/2" side K.O.'s
- 54171-3/4 . . .
—with four 3/4" side K.O.'s
- 54171-SP . . .
—with two 1/2" and two 3/4" side K.O.'s

*4-00-B—available with **FOUR** 1/4" & **FOUR** 1" side K.O.'s.

Depend on all Arrow products for premium quality; for greater time and cost economies. Specify "Arrow Conduit" in your next job order.



FREE!

WALL CHART—Box guide for maximum number of conductors. Quickly identifies boxes & covers.

ASK FOR NEW CATALOG, TOO.
WRITE FOR BOTH, TODAY!

ARROW CONDUIT & FITTINGS CORP.

129 30th STREET, BROOKLYN 32, N. Y.

Sales Representatives & *Warehouse Stocks
BALTIMORE, MD. • CHARLOTTE, N.C. • CHICAGO, ILL. • CINCINNATI, OHIO • DENVER, COLO. • DALLAS, TEX. • LOS ANGELES, CALIF. • MIAMI, FLA. • NEW YORK, N. Y. • NEWTON CENTRE, MASS. • PHILADELPHIA, PA. • ROCHESTER, N. Y.

DATES AHEAD

International Assn. of Electrical Inspectors—Mississippi Chapter, Heidelberg Hotel, Jackson, Miss., March 4-5; Missouri-Kansas Chapter, Elms Hotel, Excelsior Springs, Mo., March 11-12; Iowa Chapter, Hotel Kirkwood, Des Moines, Iowa, March 21-22; Virginia Chapter, Nansemond Hotel, Norfolk, Va., April 8-9; Tennessee Chapter, Jackson Hotel, Nashville, Tenn., April 15-16; South Carolina Chapter, Columbia Hotel, Columbia, S. C., April 18-19; Florida Chapter, Washington Hotel, Jacksonville, Fla., May 3-4; Joint meeting Baton Rouge Chapter, George Welman Chapter, North Louisiana-East Texas Chapter, Texas Chapter, Texas Gulf Coast Chapter, Heidelberg Hotel, Baton Rouge, La., May 10-11; Ellis Cannady Chapter, Carolina Hotel, Raleigh, N. C., May 14-15.

National Industrial Service Assn.—Foremen's meeting, Hotel Martinique, New York City, March 23.

National Adequate Wiring Bureau Conference — 13th annual conference, Sherman Hotel, Chicago, Ill., February 21-22.

Illuminating Engineering Society — Regional Conferences: Pacific Northwest—Empress Hotel, Victoria, V. C., March 28-29; South Pacific Coast—Statler Hotel, Los Angeles, Calif., April 3-5; Inter-Mountain — Hilton Hotel, Albuquerque, N. M., April 11-12; Southwest—Holiday Inn, Oklahoma City, Okla., April 28-30; Midwest—Astor Hotel, Milwaukee, Wisc., May 9-10; Great Lakes—Pantlind Hotel, Grand Rapids, Mich., May 13-14; Canadian — Sheraton Brock Hotel, Niagara Falls, Ont., May 16-17; East Central — William Penn Hotel, Pittsburgh, Pa., May 23-24; Northeastern—Hotel Statler, New York, N. Y., June 12-13.

Edison Electric Institute—23rd Annual sales conference, Edgewater Beach Hotel, Chicago, Ill., April 1-4.

Fourth National Electrical Industries Show—Sponsored by Eastern Electrical Wholesalers Assn., 71st Regiment Armory, New York City, April 8-11.

National Association of Lighting Maintenance Contractors—Fourth Annual Meeting, Hotel Muebach, Kansas City, Mo., April 29-May 1.

National Industrial Service Assn.—Annual convention, Statler Hotel, Buffalo, N. Y., May 12-16.

National Association of Electrical Distributors—Annual convention, Sheraton-Park and Shoreham Hotels, Washington, D. C., May 26-29.

Edison Electric Institute—Annual convention, Palmer House, Chicago, Ill., June 3-6.

Chicago Electrical Industry Show—Conrad Hilton Hotel, Chicago, Ill., June 4-6.

New York State Association of Electrical Contractors and Dealers, Inc.—Annual convention, Saranac Inn, Saranac Inn, N. Y., July 25.

Illuminating Engineering Society — 51st Annual National Technical Conference, Biltmore Hotel, Atlanta, Ga., Sept. 9-13.

National Electrical Contractors Association—Convention and Exposition, Netherland Plaza and Sheraton Plaza Hotels, Cincinnati, Ohio, November 11-16.

NEW

KLEIN

CATALOG
FOR

- LINEMEN
- ELECTRICIANS
- INDUSTRY



100 years ago in 1857, Mathias Klein opened a little forge shop in Chicago. Out of this has grown the national institution known as Mathias Klein & Sons.

To dramatize this 100 years of service to industry, Klein has prepared a completely new catalog.

It contains illustrations and descriptions of the wide range of pliers, grips, climbers, belts, safety straps—the tools and equipment needed by linemen, electricians and industry.

A new feature is a section giving the dimensions of each plier—length of handle, length of cutting knives, width of head, size of point, etc.

This Klein Catalog No. 100 will be of interest to linemen—electricians—good workmen everywhere. A copy should be in the hands of every purchaser of good tools. Write for yours.

Mathias **KLEIN** & Sons
Established 1857
7700 McGRAW HILL ROAD • CHICAGO 43, ILLINOIS

api Radiantglass ELECTRIC HEATING



No. 2200

This beautiful API Radiantglass No. 2200, the most advanced of all bathroom heaters, turns pennies per hour into millionaire luxury. Thermostatically controlled, it features a night light and ladies' electric shaver outlet right in the control panel.

Write today for full information (Bulletin EC256) on the complete API Radiantglass line of time-proven electric heating equipment.

- Easy to install, operates on 120 volts AC.
- Ra-Grid glass panel furnishes 700 watts of radiant heat.
- Designed by Raymond Loewy Associates.
- Overall size 41" high, 12 1/4" wide.
- Beautiful two-tone finish — silver and gold. Rust and tarnish proof.
- Fully guaranteed.

ALLIED PRECISION INDUSTRIES, INC.
425 STEVENS ST. — GENEVA, ILLINOIS

CIRCLESHEATH® Type RR cable

1, 2, or 3
Conductor
from 600
up to 15,000
volts for
grounded and
ungrounded
systems
Size 14 to
2,000,000 C.M.

CIRCOZONE — a butyl base ozone-resistant rubber compound designed for high voltage applications up to 15,000 volts on ungrounded systems.

Multi-conductor cables have individually insulated conductors twisted together with jute fillers, a tape cover and a neoprene sheath overall.

CIRPRENE — a tough Neoprene compound jacket with high resistance to abrasion, oils, acids, alkalis and heat. Specifically designed for direct burial in earth.

NEW WIRING CALCULATOR — FREE!

Send today for this handy, useful wiring aid. Gives conduit sizes, ampere capacities, and helpful motor running data.



CIRCLE

WIRE & CABLE
a subsidiary of
CERRO DE PASCO
CORPORATION

PLANTS: Maspeth and Hicksville, N. Y. SALES OFFICES: In all principal cities.

(Dep't. EC2) 5300 Maspeth Avenue, Maspeth, N.Y.



WHAT'S THE LAW?

By Jack and Michael Strauss

QUESTION: May an electrical contractor be penalized for obeying the law?

When the fuses in a building owned by Mr. Potter began blowing out faster than they could be replaced, Mr. Potter sought the assistance of Harry, an electrical contractor.

"You've only got two circuits in your building," Harry informed the property owner after examining the premises, "and they're unbalanced. There are many more wires on one circuit than the other. That's the trouble."

"Well," retorted Mr. Potter, "if that's the trouble, I'd like you to start repairing the system as soon as possible."

The next morning, although the price for the job had not been discussed, Harry and his crew began working. Two weeks later, the job was completed. Harry had installed 22 new circuits in Mr. Potter's building. His bill for this work was \$1,500.

"You're crazy if you think I'm going to pay you \$1,500," Mr. Potter told the electrical contractor. "You made a federal case out of a small job. I didn't hire you to install 22 new circuits . . . only even up the wires on the two existing ones."

"But I had no choice," Harry answered. "The city has adopted the National Electrical Code and the minimum requirement in a building such as yours calls for 22 circuits. I had to install them if I was going to repair your electrical system."

When Mr. Potter continued to refuse to pay for an allegedly unauthorized job, Harry sued for his money.

THIS WAS THE DECISION: Mr. Potter had to pay. The Court said there was a definite meeting of the minds on at least one point, to wit; that Harry was to repair the electrical equipment in Mr. Potter's building. That being so, he was justified in doing the work so as to meet the minimum requirements of the law . . . which called for the 22 new circuits.

(Based upon a 1953 Missouri Decision. State laws vary. For personal guidance, see your local attorney.)

Latrobe Electrical Products

There is nothing complex or intricate about "Latrobe" Floor Boxes and Wiring Specialties.

Their design and mechanism is kept simple and sure.

That is why "Latrobe" products are so quick to install and so trouble-free in operation.



**Non-Adjustable
Watertight
Floor Box**

Unique, practical design cuts installation time; makes safer job and leaves more wire space inside box. Cover Plate is 3 1/2" diameter.

**Adjustable
Floor Box**

Designed for telephone outlet or where permanent connections are made, or as a junction box. All adjustable boxes are fire-proof.



Insulator Supports

Fasten porcelain or glass insulators to steel framework without punching holes. 3 sizes—1", 1 1/2", 2" and 2 1/2".

**Keystone
Fish Wire**

Ten sizes — for lightest work to heaviest power wiring. 100, 150, and 200 foot coils.



Latrobe Products

- Non-Adjustable Floor Boxes
- Adjustable Floor Boxes
- Gang Boxes . . . Cover Plates
- Junction Boxes . . . Nozzles
- Pipe or Conduit Hangers
- Insulator Supports
- Cable Supports . . . Fish Wire
- Staple and Cable Clips

WRITE FOR NEW CATALOG

Sales Representatives in all principal cities.



Among the Manufacturers

Headquarters Announcements

Kaiser Aluminum & Chemical Corp. announces purchase of wire and cable business of the United States Rubber Co., including plant at Bristol, Conn., and its wire and cable inventories.

McGraw-Edison Co. has been formed with the combined assets of the McGraw Electric Co. and Thomas A. Edison, Inc.

Crescent Co., Inc., Pawtucket, R. I., has acquired the land, buildings and mechanical equipment of the Lowell Insulated Wire Co., Lowell, Mass.

Minneapolis-Honeywell Regulator Co. announces combining of the Doelcam Division and the Transistor Division under the new Boston Division, to be known as the Instruments Section and Semiconductor Section respectively. George J. Schwartz, divisional vice-president and general manager, will direct the new division.

Russell & Stoll Co. and Feedrail Corp., New York—Albert F. Stoll, chairman of the board; Frank L. Novak, president; Alexander Hammond, vice president and treasurer; J. A. Heinzelman, secretary.

Feedrail Corp., New York—Russell R. Stout, sales manager.

Westinghouse Lamp Division, Bloomfield, N. J.—Wilbert A. Taebel, engineering manager, lamp parts department.

Electro-Snap Switch & Mfg. Co., Chicago, Ill.—Harold Ames, Jr., president.

A. O. Smith Corp., Permaglas Div., Kankakee, Ill.—W. T. Halket, general sales manager of water heating products; J. W. Burleson, general sales manager, heating and air conditioning products.

General Electric Co., Schenectady, N. Y.—Two new vice presidents: William S. Ginn, general manager, Transformer Div., Pittsfield, Mass.; Jack S. Parker, general manager, Aircraft Gas Turbine Div., Cincinnati, O.

Thomas Industries Inc. has acquired the plant of the Radiant Glass Co., Fort Smith, Ark., to be known as the Radiant Glass Div.

John C. Virden Co., Cleveland, Ohio, has acquired the stock of the Holdenline Co., Cleveland, which will become a subsidiary.

Westinghouse Electronic Tube Div., Elmira, N. Y.—Franklin P.

Don't worry about
the ELEPHANT...



HE'S ON A BAKER SCAFFOLD

No, Baker Scaffolds aren't designed for elephants. But they are designed for loads up to 800 pounds with a safety factor of 4. The strength and stability is always there in greater amounts than the loads that are put on them.

Absence of X-Bracing permits easy spanning of intervening objects, giving a great variety of uses. And they are easily and quickly set up or taken down. Mounted on casters, the Baker Scaffold is easily moved anywhere, through doorways, down halls, to the job to be done.

The Baker Scaffold can help you with your job, too. Write for Bulletin 573.

Listed under Reexamination Service
Underwriters' Laboratories, Inc.

Distributors in Principal Cities
BAKER-ROOS, INC.
P. O. Box 892, Indianapolis 6, Indiana



BAKER-ROOS, INC.

P. O. Box 892, Indianapolis 6, Indiana

Gentlemen: Please send me full details and photos of Baker Scaffolds in action, without obligation.

Name _____

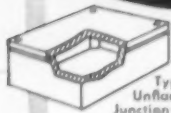
Business _____

Address _____

City _____

State _____

**FOR
LOWER COST
FASTER DELIVERIES**
*Turn to
Spring City*



Type S
Unflanged
Junction Box

Because
Spring City
has foundry
operations right

at the plant site, you can count
on faster deliveries and lower
cost. See for yourself. New
Catalog 10 has just been published.
Write for your free copy.

**JUNCTION AND PULL BOXES
CONDUIT BOXES
HINGED CABINETS
EXPLOSION HOUSINGS
MARKER LIGHT BOXES
FIXTURE OUTLET BOXES
SIDEWALK BOXES**



**SPRING CITY
ELECTRICAL MFG. CO.**

Spring City 4, Pennsylvania

**YOU
PROFIT**



by selling
**NEW
Big Beam
AUTOMATIC EMERGENCY LIGHTS**
with Glass Jar Batteries

Heavy-duty, long-lived glass jar batteries come in 30, 40, 80, and 100 amp.-hr. sizes. Built-in trickle charger and fast charger has 12-hour automatic timer.

It's the most COMPLETELY DEPENDABLE emergency light ever built. When regular lights fail... this new Big Beam turns on instantly... provides many hours of illumination.



**NEW Big Beam
EXPLOSION-PROOF
HAND LAMP**

Approved by Underwriters' Laboratories for use in hazardous locations, Class I, Group D. Designed to meet popular demand for a SAFE lamp with Big Beam's quality features.

Write for Literature Today

U-C-LITE Manufacturing Co.
1035 West Hubbard Street, Chicago 22, Illinois
In Canada: Bernard Marks & Co., Ltd., 710 Claremont Street, Toronto 3, Ontario

**A NEW INSULATION TESTER
IN NON-BREAKABLE TEAKWOOD CASE**

A SMALL SIZE, LIGHT WEIGHT INSTRUMENT AT A LOW PRICE
- BUT WITH LONG SCALE AS IN LARGE SIZE INSTRUMENTS

New "MAJOR" MEGOHMER

WITH 500 VOLT CONSTANT PRESSURE DC GENERATOR
RANGE: 0-50 MEGOHMS WITH EXTRA OHM SCALE

0-10,000 ohms or 0-30 ohms. Size 7 1/2" x 4" x 4".
Weight: 4 lbs. 14 ozs. Furnished with solid leather
carrying case and 12 ft. test leads. True ohmmeter
movement independent of generator voltage.

A REMARKABLE INSTRUMENT AT A REMARKABLE PRICE

HERMAN H. STICHT COMPANY, INC.

27 PARK PLACE NEW YORK, N. Y.



SEND
FOR
BULLETIN
465

McGraw-Hill Mailing Lists Will Help You

for Results



**Mc GRAW-HILL
DIRECT MAIL LIST SERVICE**

- Merchandise your advertising
- Conduct surveys
- Get inquiries and leads for your salesmen
- Pin-point geographical or functional groups
- Sell Direct
- Build up weak territories
- Aid Dealer relations

Direct Mail is a necessary supplement to a well rounded Business Paper advertising program.

Most progressive companies allocate a portion of their ad budgets to this second medium at the same time as they concentrate on the best business publications. 600,000 of the top buying influences in the fields covered by the McGraw-Hill publications make up our 150 mailing lists. Pick Your prospects out of our Industrial Direct Mail catalogue.

Write for your free copy of our Industrial Direct Mail catalogue with complete information.

Hinman, operations manager, cathode ray and power tube departments.

Warner Electric Brake & Clutch Co., Beloit, Wis.—Alonzo A. Neese, chairman of the board.

Robertshaw-Fulton Controls Co. announces acquisition of the Beta Corp., Richmond, Va., and Acro Mfg. Co., Columbus, Ohio.

General Electric's Metallurgical Products Dept., Edmore, Mich., plant, is to be known as the Magnetic Materials Section of the department, with E. E. George as general manager.

Wolverine Tube Div. of Calumet & Hecla, Inc.—L. G. Fox, manager of products; H. A. Harty, manager of advertising sales promotion.

Burndy Corp., Norwalk, Conn.—Sidney Wolberg, vice president, purchasing; Stanley M. Loomis, vice president, finance; George M. Szabad, vice president and counsel.

General Electric's Power Transformer Dept., Pittsfield, Mass.—Philip H. Alspach, manager of manufacturing. New operating component of the department is the Voltage Regulator Product Section with J. W. Butler as marketing manager.

Molly Corp., Reading, Pa.—R. M. Forsberg, vice president and director.

Federal Pacific Electric Co., Eastern Switchgear Div., Scranton, Pa.—Donald C. Mills, manager of development engineering.

General Electric's Metallurgical Products Dept., Detroit, Mich.—Herbert E. Ihrig, manager of marketing administration and personnel development.

Edwards Co., Norwalk, Conn.—Robert L. Kempton, general sales manager.

General Electric Co., Schenectady, N. Y., announces division of Medium Induction Motor Dept. into Medium A-C Motor and Generator Dept. with O. F. Vea as general manager, and Small A-C Motor and Generator Dept. with Bryce W. Wyman as general manager.

Philadelphia Electrical & Mfg. Co., Philadelphia—E. Fred Bahls as sales manager.

Gould-National Batteries, Inc., Trenton, N. J.—Carson I. Simms, manager of utility sales, industrial division.

Radix Wire Co., Cleveland, Ohio—James B. Irwin, sales manager.

General Electric's Commercial and Industrial Air Conditioning Dept.—C. Benjamin Ramsdell, general manager.

H. K. Porter Co., Inc., New York

Grips the screw!

Drives it too!

Quick-Wedge SCREW-HOLDING SCREWDRIVER

2" to 14" blades, 4 bit sizes.
Available with shockproof
plastic covered tubing
Unconditionally guaranteed



ASK FOR IT AT YOUR DEALER

Kedman Co., 233 South 5th W.,
Salt Lake City, Utah

—Fred C. Foy, board of directors;
T. M. Evans, chairman; Charles L.
Holbert, president.

Day-Brite Lighting, Inc., St.
Louis, Mo.—Charles L. Amick,
manager, sales department.

Anderson Electric Corp., Birm-
ingham, Ala.—R. E. Schuler, chair-
man of the board; Thomas H. Fox,
president; John H. Schuler, vice
president and secretary.

Allis Chalmers Mfg. Co., Mil-
waukee, Wis.—W. L. Peterson,
manager, Regulator Dept.; J. R.
Mann, manager, Transformer
Dept.; G. W. Clothier, manager,
Motor and Generator Dept.

Rea Magnet Wire Co., Inc., Fort
Wayne, Ind., announces appoint-
ment of Permacel Tape Corp., New
Brunswick, N. J., as national sales
agent for electrical motor repair
field. Permacel Tape Corp. has
established the Electrical Products
Sales Div. under the direction of
Norman Hickok to handle these and
other electrical products.

Graybar Electric Co., New York
—C. E. Kirkpatrick, director.

Fairbanks Morse & Co., Chicago,
Ill.—P. R. Flood, general manager,
Beloit, Wis., works; W. P. Mc-
Anally, manager, Pomona, Calif.,
works; C. H. Johnson, general
manager, Stuttgart, Ark., works.

Thompson Products, Inc., Cleve-
land, Ohio—G. R. Moore, staff vice
president, sales and advertising.

Johnson Service Co., Milwaukee,
Wis.—John H. Colby, vice presi-
dent and general sales manager.

Century Lighting, Inc., New
York has formed a new Color
Lighting Dept. with Rollo Gillespie
Williams as manager.

Motor Wheel Corp., Appliance
Div., Lansing, Mich.—L. C. Van-
dertill, vice-president and director.

Regional Appointments

MIDDLE ATLANTIC

Weston Electrical Instrument
Corp.: Dudley K. Bailey, district
sales manager for Buffalo territory,
office in Buffalo.

Yale & Towne Mfg. Co.: Louis
W. Jander, eastern regional sales
manager, Yale Materials Handling
Div., office in Philadelphia.

Westinghouse Lamp Division:
Robert P. Shelly, Philadelphia, dis-
trict sales manager, office in Phila-
delphia.

Mitchell Mfg. Co.: Raub Supply
Co., distributor of room air condi-
tioners in Lancaster-Harrisburg
area, Pa.

Furnas Electric Co.; Rocke In-
ternational Corp., export sales divi-
sion, home office in New York City.

SIMPLE ARITHMETIC

Materials + labor + overhead = cost

Cost + profit = selling price

NOT SO SIMPLE

What do materials cost - today?

What is your overhead cost?

Since 1926



NATIONAL PRICE SERVICE

Answers those "NOT SO SIMPLE"

questions quickly, accurately,
economically and PROFITABLY.

No electrical contractor should
be without it. Find out for yourself!

HENDERSON-HAZEL CORP. DEPT. A72

13601 Euclid Avenue, Cleveland 12, Ohio

Please send complete details about
NATIONAL PRICE SERVICE* to us
immediately - no obligation.

Name _____

Title _____

Company _____

Address _____

City _____ Zone _____ State _____

THIEL TRANSFORMER HANGERS

MODEL	C-1	C-2
TRANS- FORMER	75-100 EVA	75-112½ EVA
SINGLE PHASE	THREE PHASE	THREE PHASE
WEIGHT	46 LBS.	100 LBS.

HANGER HICKERS
IN SIZES TO 1-TYPE
HANGERS

THIEL HANGERS are
made according to
NEMA Specifications—
HEAVY STEEL con-
struction, HOT-DIP
galvanized for depend-
able service and long
life. Two styles com-
plete with galvanized
bolts and nuts.

IN STOCK FOR
IMMEDIATE DELIVERY

T-TYPE HANGERS
in the sizes 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1041-1042-1043-1044-1045-1046-1047-1048-1049-1050-1051-1052-1053-1054-1055-1056-1057-1058-1059-1060-1061-1062-1063-1064-1065-1066-1067-1068-1069-1070-1071-1072-1073-1074-1075-1076-1077-1078-1079-1080-1081-1082-1083-1084-1085-1086-1087-1088-1089-1090-1091-1092-1093-1094-1095-1096-1097-1098-1099-1100-1101-1102-1103-1104-1105-1106-1107-1108-1109-1110-1111-1112-1113-1114-1115-1116-1117-1118-1119-1120-1121-1122-1123-1124-1125-1126-1127-1128-1129-1130-1131-1132-1133-1134-1135-1136-1137-1138-1139-1140-1141-1142-1143-1144-1145-1146-1147-1148-1149-1150-1151-1152-1153-1154-1155-1156-1157-1158-1159-1160-1161-1162-1163-1164-1165-1166-1167-1168-1169-1170-1171-1172-1173-1174-1175-1176-1177-1178-1179-1180-1181-1182-1183-1184-1185-1186-1187-1188-1189-1190-1191-1192-1193-1194-1195-1196-1197-1198-1199-1200-1201-1202-1203-1204-1205-1206-1207-1208-1209-1210-1211-1212-1213-1214-1215-1216-1217-1218-1219-1220-1221-1222-1223-1224-1225-1226-1227-1228-1229-1230-1231-1232-1233-1234-1235-1236-1237-1238-1239-1240-1241-1242-1243-1244-1245-1246-1247-1248-1249-1250-1251-1252-1253-1254-1255-1256-1257-1258-1259-1260-1261-1262-1263-1264-1265-1266-1267-1268-1269-1270-1271-1272-1273-1274-1275-1276-1277-1278-1279-1280-1281-1282-1283-1284-1285-1286-1287-1288-1289-1290-1291-1292-1293-1294-1295-1296-1297-1298-1299-1300-1301-1302-1303-1304-1305-1306-1307-1308-1309-1310-1311-1312-1313-1314-1315-1316-1317-1318-1319-1320-1321-1322-1323-1324-1325-1326-1327-1328-1329-1330-1331-1332-1333-1334-1335-1336-1337-1338-1339-1340-1341-1342-1343-1344-1345-1346-1347-1348-1349-1350-1351-1352-1353-1354-1355-1356-1357-1358-1359-1360-1361-1362-1363-1364-1365-1366-1367-1368-1369-1370-1371-1372-1373-1374-1375-1376-1377-1378-1379-1380-1381-1382-1383-1384-1385-1386-1387-1388-1389-1390-1391-1392-1393-1394-1395-1396-1397-1398-1399-1400-1401-1402-1403-1404-1405-1406-1407-1408-1409-1410-1411-1412-1413-1414-1415-1416-1417-1418-1419-1420-1421-1422-1423-1424-1425-1426-1427-1428-1429-1430-1431-1432-1433-1434-1435-1436-1437-1438-1439-1440-1441-1442-1443-1444-1445-1446-1447-1448-1449-1450-1451-1452-1453-1454-1455-1456-1457-1458-1459-1460-1461-1462-1463-1464-1465-1466-1467-1468-1469-1470-1471-1472-1473-1474-1475-1476-1477-1478-1479-1480-1481-1482-1483-1484-1485-1486-1487-1488-1489-1490-1491-1492-1493-1494-1495-1496-1497-1498-1499-1500-1501-1502-1503-1504-1505-1506-1507-1508-1509-1510-1511-1512-1513-1514-1515-1516-1517-1518-1519-1520-1521-1522-1523-1524-1525-1526-1527-1528-1529-1530-1531-1532-1533-1534-1535-1536-1537-1538-1539-1540-1541-1542-1543-1544-1545-1546-1547-1548-1549-1550-1551-1552-1553-1554-1555-1556-1557-1558-1559-1560-1561-1562-1563-1564-1565-1566-1567-1568-1569-1570-1571-1572-1573-1574-1575-1576-1577-1578-1579-1580-1581-1582-1583-1584-1585-1586-1587-1588-1589-1590-1591-1592-1593-1594-1595-1596-1597-1598-1599-1600-1601-1602-1603-1604-1605-1606-1607-1608-1609-1610-1611-1612-1613-1614-1615-1616-1617-1618-1619-1620-1621-1622-1623-1624-1625-1626-1627-1628-1629-1630-1631-1632-1633-1634-1635-1636-1637-1638-1639-1640-1641-1642-1643-1644-1645-1646-1647-1648-1649-1650-1651-1652-1653-1654-1655-1656-1657-1658-1659-1660-1661-1662-1663-1664-1665-1666-1667-1668-1669-1670-1671-1672-1673-1674-1675-1676-1677-1678-1679-1680-1681-1682-1683-1684-1685-1686-1687-1688-1689-1690-1691-1692-1693-1694-1695-1696-1697-1698-1699-1700-1701-1702-1703-1704-1705-1706-1707-1708-1709-1710-1711-1712-1713-1714-1715-1716-1717-1718-1719-1720-1721-1722-1723-1724-1725-1726-1727-1728-1729-1730-1731-1732-1733-1734-1735-1736-1737-1738-1739-1740-1741-1742-1743-1744-1745-1746-1747-1748-1749-1750-1751-1752-1753-1754-1755-1756-1757-1758-1759-1760-1761-1762-1763-1764-1765-1766-1767-1768-1769-1770-1771-1772-1773-1774-1775-1776-1777-1778-1779-1780-1781-1782-1783-1784-1785-1786-1787-1788-1789-1790-1791-1792-1793-1794-1795-1796-1797-1798-1799-1800-1801-1802-1803-1804-1805-1806-1807-1808-1809-1810-1811-1812-1813-1814-1815-1816-1817-1818-1819-1820-1821-1822-1823-1824-1825-1826-1827-1828-1829-1830-1831-1832-1833-1834-1835-1836-1837-1838-1839-1840-1841-1842-1843-1844-1845-1846-1847-1848-1849-1850-1851-1852-1853-1854-1855-1856-1857-1858-1859-1860-1861-1862-1863-1864-1865-1866-1867-1868-1869-1870-1871-1872-1873-1874-1875-1876-1877-1878-1879-1880-1881-1882-1883-1884-1885-1886-1887-1888-1889-1890-1891-1892-1893-1894-1895-1896-1897-1898-1899-1900-1901-1902-1903-1904-1905-1906-1907-1908-1909-1910-1911-1912-1913-1914-1915-1916-1917-1918-1919-1920-1921-1922-1923-1924-1925-1926-1927-1928-1929-1930-1931-1932-1933-1934-1935-1936-1937-1938-1939-1940-1941-1942-1943-1944-1945-1946-1947-1948-1949-1950-1951-1952-1953-1954-1955-1956-1957-1958-1959-1960-1961-1962-1963-1964-1965-1966-1967-1968-1969-1970-1971-1972-1973-1974-1975-1976-1977-1978-1979-1980-1981-1982-1983-1984-1985-1986-1987-1988-1989-1990-1991-1992-1993-1994-1995-1996-1997-1998-1999-2000-2001-2002-2003-2004-2005-2006-2007-2008-2009-2010-2011-2012-2013-2014-2015-2016-2017-2018-2019-2020-2021-2022-2023-2024-2025-2026-2027-2028-2029-2030-2031-2032-2033-2034-2035-2036-2037-2038-2039-2040-2041-2042-2043-2044-2045-2046-2047-2048-2049-2050-2051-2052-2053-2054-2055-2056-2057-2058-2059-2060-2061-2062-2063-2064-2065-2066-2067-2068-2069-2070-2071-2072-2073-2074-2075-2076-2077-2078-2079-2080-2081-2082-2083-2084-2085-2086-2087-2088-2089-2090-2091-2092-2093-2094-2095-2096-2097-2098-2099-2100-2101-2102-2103-2104-

It doesn't
Cost...
it Pays
to use...

HELWIG CARBON BRUSHES

Brushes are manufactured to size — need not be cut down to fit commutator. It pays to protect your electrical equipment with **HELWIG CARBON BRUSHES.**

HELWIG CO. CARBON PRODUCTS

2546 N. 30th ST.
MILWAUKEE 10, WIS.



Sound Powered Telephones

need
no
batteries



Never fail in any emergency because they operate without current of any kind over a distance of many miles. Can be moved with the job as construction progresses or serve permanently where power failures may occur. In outdoor and indoor models.



Write for illustrated catalog

HOSE-McCANN
TELEPHONE CO., INC.

761 THIRD AVENUE, BROOKLYN 32, N. Y.

Edison Storage Battery Division, McGraw-Edison Co.: John E. McDonnell, New York district manager.

R. E. Uptegraff Mfg. Co.: Russell F. Clark Co., representative for Western Pennsylvania and West Virginia's panhandle. Office in Pittsburgh.

Perfection Industries: Alan H. Jobson Jr., district manager, New York area.

Graybar Electric Co.: F. C. Sweeney, manager, Queens Plaza operation, New York City; J. P. McCarthy, manager, Newark location, N. J.

SOUTH ATLANTIC

Keystone Mfg. Co.: W. T. Evans, Ft. Lauderdale, Fla.; Robert P. Auer, Baltimore, Md.; Paul Mayo, Richmond, Va.—representatives.

Clark Controller Co.: new sales office in Baltimore, Md., Edward M. Hanson, manager.

Thor Power Tool Co.: new branch office in Richmond, Va., Kenneth V. Bennet, manager.

General Electric Company's Housewares and Radio Receiver Div.: new service center in Atlanta, Ga., also serving as regional sales headquarters.

Mitchell Mfg. Co.: Harold Kreegel, district sales manager in Florida for air conditioners.

Cummins Power Tool Div., John Oster Mfg. Co.: Robert J. McGranaghan, sales representative, Philadelphia, Baltimore and Washington D. C.

EAST CENTRAL

Weston Electrical Instruments Corp.: Edward B. Annett, Jr., district sales manager, Cincinnati territory, office in Cincinnati.

Thor Power Tool Co.: Richard E. James Jr., manager, new branch office in Indianapolis for operations in Indiana and Western Kentucky.

Insulation Manufacturers Corp.: Insulation & Copper Sales, Detroit, representative.

Robertshaw-Fulton Controls Co.: Sales engineering staff of Fielden Instrument Div., Cleveland, Ohio, has moved to 6116 St. Clair Ave.

United States Steel Corp., American Steel and Wire Div.: Walter L. Longnecker, Cleveland District manager of operations; Edward A. Murray, manager, Chicago district sales department; Charles P. Greenlee, manager, Detroit district sales department.

Yale & Towne Mfg. Co.: Neal J. Kemp Jr., Midwestern Regional Sales Manager, Yale Materials Handling Div., office in Chicago.

Millions of Steel

JEFFY CLIPS

Serving the Electrical Industry



Specify
MINERALLAC
HANGERS, CLIPS,
STRAPS, BUSHINGS

Expert design, choice materials and controlled manufacture have built "top-service and longest life" into Minerallac Electrical Specialties. That's why the electrical industry "prefers Minerallac"... in steel and Everdur for hanging pipe, conduit, BX cable, etc.

Send for new literature and prices.

MINERALLAC ELECTRIC COMPANY
25 North Peoria Street—Chicago 7, Illinois

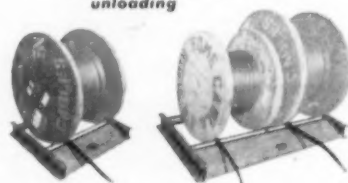
MINERALLAC

SAVE TIME AND MONEY HANDLING CABLE REELS

Easy, simple, fast! Minimum loading
and unreeling effort.
Modernly efficient

FOR WIRE, CABLE, ROPE

- Heavy gauge steel frame
- Slanted front
- Ball bearing adjustable rollers
- No jacks
- Handles any reel diameters
- Positive roller lock for unloading



Style A 2,000 lbs. cap. for reels up to 28 in. wide. 37.50 f.o.b. Cincinnati.
Style B 4,000 lbs. cap. for 2 reels up to 24 in. wide each or 1 reel up to 48 in. wide. 75.00 f.o.b. Cincinnati.

WRITE FOR DETAILS TODAY

ROLL-A-REEL

1100 Sycamore at Central Parkway
Cincinnati 2, Ohio

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT • BUSINESS
EQUIPMENT — USED OR RESALE
OPPORTUNITIES

UNDISPLAYED RATE

(Not available for equipment advertising)
\$1.50 a line, minimum 3 lines.

POSITIONS WANTED undisplayed rate is one-half of above rate, payable in advance.

Box Numbers—Count as one line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

DISPLAYED RATE

EQUIPMENT & BUSINESS OPPORTUNITY advertising \$12.90 per inch.

EMPLOYMENT OPPORTUNITIES—\$19.50 per inch, subject to Agency Commission.

An advertising inch is measured $\frac{1}{2}$ " vertically on one column, 2 columns—30 inches—to a page.

Send new ads to Classified Advertising Div., Electrical Construction & Maintenance, P.O. Box 12, New York 36, N. Y. March issue closes February 21st.

REPLIES (Box No.): Address to office nearest you
c/o This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)
CHICAGO: 586 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SPECIAL SERVICES

Consult. Elect. Engr. S.E.E. P.E. established
N.Y.C. office Comm. Indust. light & pwr., design & engineering services available. SS-4126, Electrical Construction & Maintenance.

WANTED — MANUFACTURERS REPRESENTATIVES
FOR A MEDIUM WIRE & CABLE FIRM.
WILL MANUFACTURE ALL WIRES TO ORDER.
POT WIRE, BATTERY CABLES, TV WIRES, DOOR BELL WIRE, TOOL WIRE, BUILDING WIRES AND ETC. CAPACITY OF FIVE WIRES 1 Million Ft. Daily. Will beat all Competition. Write to

RW-3930, Electrical Const. & Maint.
Class. Adv. Div. P. O. Box 12, N. Y. 36, N. Y.

FOR SALE MOTOR REPAIR SHOP and INDUSTRIAL WIRING

Very profitable. Well established. Reasonable.
South Central.

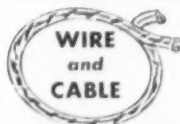
ISO-4053, Elect. Constr. & Maint.,
520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL CONTRACTORS ESTIMATING HANDBOOK

"A Unique Tool of the Trade"

WRITE FOR DESCRIPTIVE FOLDER TO
THE ESTIMATOR PUBLISHING CO.

4102 Wilson Road Kenosha, Wis.



When you want it

Busy Contractors call Universal Wire & Cable for their immediate needs for all types of Cable. Complete stocks—All Sizes of:

Type RR 600 V, 5000 V, 15000 V
Asbestos—AVA-AVL-AA-AIA
Interlocked Armor—O to 5000 V
Varnished Cambric 600 V, 5000 V, 15000 V
Building Wires—RHRW-RHW-TW-R

UNIVERSAL Wire & Cable Co.
2921 N. PAULINA ST. - CHICAGO 13, ILL.

Branches in:
Houston, Texas & Los Angeles, California

QUOTATIONS CHEERFULLY MADE
SEND US YOUR REQUIREMENTS

Westinghouse Lamp Division:
Joseph F. Kemp, Jr., midwestern
regional sales manager, office in
Chicago.

Perkin Engineering Corp.: Loren
F. Green and Associates, representatives of power supplies and line regulators in Illinois, Wisconsin, Indiana and Eastern Iowa.

Miller Company: Dean J. Harryman, sales representative for Illuminating Div., Milwaukee territory.

Minnesota Mining & Mfg. Co.: Edward A. Freiburger, Chicago branch sales manager, Electrical Products Div.

Victor Electric Wire and Cable Corp.: John G. Twist Co., Chicago, sales representatives in Illinois and Wisconsin.

Sorensen & Co., Inc.; Pivan Engineering Co., representative in Illinois, Indiana, Wisconsin and Eastern Iowa, office in Chicago.

Rubber and Asbestos Corp.: Robert E. Blackmore, technical sales representative, office in Berwyn, Ill.

Day-Brite Lighting, Inc.: Brooks Chassaing, midwestern regional sales manager.

WEST CENTRAL

Keystone Mfg. Co.: Mid-South Associates, Little Rock, Ark.; and Wood and Anderson, Mission, Kans.; new representatives.

Pittsburgh Standard Conduit Co.: Ralph B. Black, agent in New Mexico and El Paso, Tex., area, office in Albuquerque.

Sorensen & Co., Inc.: Pinkney & Hine, representative in North Dakota, South Dakota, Minnesota and Western Wisconsin.

Fasco Industries, Inc.: New sales representatives. Gaines & Co., Kansas City, Mo., for Kansas City area; Clyde E. Malone & Associates, St. Louis, Mo., for St. Louis area.

WEST

Tilden Tool Mfg. Co.: Paul L. Cipra, territorial representative in Utah, Colorado, Wyoming and N. M. Weston Electrical Instrument Corp.: Kenneth C. Moulton, manager, Los Angeles branch office.

Keystone Mfg. Co.: New sales representatives: Electric Sales Co., Los Angeles; A. J. Nelson Co., Denver, Colo. and Albuquerque, N. M.

Bristol Co.: John E. Kearns, manager, new district office in San Francisco.

International Wire Products Co.: Bucky Harris Co., West Coast mill representatives.

Pyle-National Co.: William R. Raymond, West Coast regional manager.

WHERE To BUY

Equipment, Materials,
Supplies and Services for
Electrical Construction—
Maintenance—Repairs



**MAKES TRANSFORMERS for
EVERY VOLTAGE and
INSTALLATION!**

Of course you want a smooth running plant. One answer is Atlantic custom built transformers—assuring you of highest efficiency, lowest losses—plus excellent regulation! There's a design to fit your needs perfectly... our engineers can suggest the correct models for your layout, and you get facilities installation and service. Care for the heart of your plant!

- Unmatched quality of construction!
- Lower initial cost and upkeep!
- Dependable, courteous service!

Agency Distributors Wanted

Write For Free Illustrated Catalog

Atlantic Transformer Co.

5143 N. SECOND ST.
PHILADELPHIA 20, PENNA.

SUPERIOR TOP QUALITY
AT LOW QUANTITY PRICES

Slimline
FLUORESCENT LAMPS!



DEPENDABLE, HIGH LUMEN OUTPUT,
TOP QUALITY, LONGER LIFE
write for our special low quantity prices

SUPRO LUX
MANUFACTURING CO., INC.

406A EAST 161st ST., BRONX 51, N. Y.

ROBOT OPERATORS

OPEN - CLOSE - LOCK DOORS, GATES

... Electronically

COMMERCIAL, INDUSTRIAL

RESIDENTIAL & SPECIAL

Write for Catalog...

ROBOT APPLIANCES, INC.

7041 ORCHARD - GEARBORN, MICHIGAN

AN INVESTMENT

Productive advertising is an investment rather than an expenditure.

BE CONVINCED—send us your
"Where To Buy" advertisement
TODAY.

**ELECTRICAL CONSTRUCTION
and MAINTENANCE**

PO Box 12, New York 36, N. Y.

Advertising In This Issue

Abolite Ltd. Division, The Jones Metal Products Company	116
• Accurate Manufacturing Company	Second Cover
• Advance Transformer Company	115
Allen-Bradley Company	167, 168
Allied Precision Industries, Inc.	206
Allis-Chalmers Manufacturing Company	132
• American Brass Company, The American Metal Hose Branch	139
• American Steel & Wire Division, of U. S. Steel Corporation	40, 41
American Telephone & Telegraph Company	11
Amplex Corporation	8
Amprobe, A Division of Pyramid Instrument Corporation	21
Anderson Electric Corporation	53
Appleton Electric Company	2
• Arrow Conduit & Fittings Corporation	205
• Arrow Hart & Hegeman Electric Company	152, 153
Atlantic Transformer Company	211
Auth Electric Company, Inc.	52
Baker-Ross, Inc.	207
Baldor Electric Company	147
Beaver Pipe Tools, Inc.	164
Belden Manufacturing Company	199
Bell Telephone System	11
Benjamin Electric Manufacturing Company	123
Biddle Company, James G.	171
Bin-Dicator Company, The	200
Black & Decker Manufacturing Company	175
• Blackhawk Industries	144
• Blackhawk Manufacturing Company	39
Briegleb Method Tool Company	46
• Bryant Electric Company, The	10
Buffalo Forge Company	203
BullDog Electric Products Company	61
Century Electric Company	17
• Certified Ballast Mfgs.	163
Champion DeArment Tool Company	110
Chelsea Fan & Blower Company, Inc.	128
• Circle Wire & Cable, A Subsidiary of Cerro de Pasco Corporation	206
Compo Corporation	126
Conduit Pipe Products Company	202
Cope Inc., T. J.	156
• Cordomatic Corporation	111
Corning Glass Works	158, 159
• Crouse-Hinds Company	6
Curtis Lighting Inc.	191
Cutler-Hammer, Inc.	45
• Day-Brite Lighting, Inc.	140, 141
Delta Engineering Sales Company	174
Diamond Wire & Cable Company	44
Dodge Corporation, F. W.	62
duPont de Nemours & Co., Inc., E. I.	51, 161
Dutch Brand Div., Johns-Manville Corp.	66
• Edwards Company	104
Efficiency Electric & Mfg. Company	200
Electric Controller & Mfg. Co., a Division of The Square D Co.	9
Electromode Division of Commercial Controls Corporation	201
Erica Products, Inc.	157
Essex Industrial Division, The Electric Storage Battery Company	181
• Federal Pacific Electric Company	103, 105
• Feedrail Corporation	129
• Fullman Manufacturing Company	207
Furnas Electric Company	138
• Garden City Plating & Mfg. Company	113
• General Cable Corporation	145
• General Electric Company	Fourth Cover
• Apparatus Sales Division	30, 31, 32, 34, 35
Lamp Division	33
• Wiring Device Department	28, 29
Goodrich Chemical Company, B. F.	38
• Graybar Electric Company, Inc.	68

• Greenlee Tool Company	142
• Guth Company, The Edwin F.	43
Heinemann Electric Company	154
• Helwig Company	210
• Henderson-Hazel Corporation	209
Hexcel Products Inc.	23
• Hose-McCann Telephone Company, Inc.	210
Hubbell Inc., Harvey	114
• Husky Products, Inc.	149
• Ideal Industries Inc.	165, 190
• Ideal-Simplet Fittings, Inc.	197
• I-T-E Circuit Breaker Company	Small Air Circuit Breaker Division 58, 59
Switchgear Division	170
• Johns-Manville	22
Jones Metal Products Co., The	116
Kaiser Aluminum & Chemical Sales Inc.	12, 13
Kedman Company	209
Kerrigan Iron Works, Inc.	24
• Keystone Manufacturing Company	122
• Killark Electric Manufacturing Company	19
Klein & Sons, Mathias	205
Lidseer, Inc., G.	174
Lighting Products Inc.	109
Litecontrol Corporation	48
• Marcus Transformer Company, Inc.	204
• McGill Manufacturing Company	36
Micro Switch, a Division of Minneapolis-Honeywell Regulator Company	50
• Midwest Electric Manufacturing Company	136
Miller Company, The	55
• Mineralac Electric Company	210
Minnesota Mining & Manufacturing Company	37
National Electric Products Corporation	143
• National Price Service	209
• O. Z. Electrical Manufacturing Co., Inc.	57
• Okonite Company, The	16, 60
• Onan & Sons Inc., D. W.	192
• Oster Manufacturing Company, The	112
Pass & Seymour, Inc.	47
Pennsylvania Drilling Company	198
• Phelps Dodge Copper Products Corporation	65
Pierce Renewable Fuses, Inc.	204
• PLM Products, Inc.	162
• Quadrangle Mfg. Company	124
Quaker & Quaker Pioneer Rubber Divisions, H. K. Porter Company, Inc.	148
Ramsel Fastening Inc.	188
• Rawlplug Company Inc., The	146
• Remcon, A Div. of Pyramid Instrument Corp.	1
• Remington Arms Company, Inc.	179
Republic Steel Corporation	130, 131
Revere Electric Manufacturing Company	173
Ridge Tool Company, The	155
Robot Appliances, Inc.	211

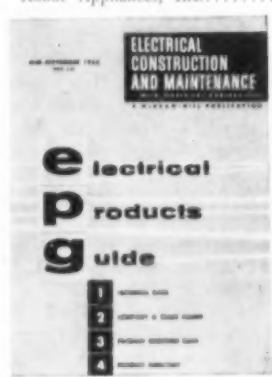
Rockbestos Products Corporation	125
• Rodale Mfg. Company, Inc.	160
Rohm & Haas Company	120
Roll-A-Reel	210
• Rome Cable Corporation	26, 27
Royal Electric Corporation	172
• S & C Electric Company	63
Sangamo Electric Company	196
• Simplex Wire & Cable Company	49
• Slater Electric & Mfg. Company, Inc.	187
Smithcraft Lighting	193
Sola Electric Company	189
Spang-Chalfant (Div. of the National Supply Company)	127
Spartan Faraday Inc.	20
Spring City Electrical Mfg. Company	208
Square D Company	Third Cover, 106
• Standard Transformer Company	198
• Steber Mfg. Company	182
Steel City Electric Company	25
Steel & Tubes Division	130, 131
• Sticht Company, Inc., Herman H.	208
Sunbeam Lighting Company	185
Supro Lux Mfg. Company, Inc.	211
Sylvania Electric Products Inc.	15
• Thiel Tool & Engineering Company, Inc.	209
• Thomas & Betts Company, The	194
• Tork Clock Company, Inc.	184
• U.C. Lite Manufacturing Company	208
• Union Insulating Company	180
Union Metal Manufacturing Company, The	186
• United States Rubber Company	117
Universal Motor Company	203
Up-Right Scaffolds Co.	18
Voltage Tester Division, Pyramid Instrument Corp.	176
• Wadsworth Electric Mfg. Co., Inc., The	202
• Wagner Electric Corporation	14, 178
Walker Brothers	42
Walker Division, The Norma-Hoffman Bearings Corporation	180
• Western Insulated Wire Company	196
• Westinghouse Electric Corporation	Lamp Division 118, 119
• Pittsburgh	64, 150, 151, 183
• Wheelock Signals Inc.	108
• Wheel Tracing Tool Company	166
Where To Buy	211
• Wiegand Company, Edwin L.	56
• Youngstown Sheet & Tube Company, The	54

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.	211
EMPLOYMENT OPPORTUNITIES	211
SPECIAL SERVICES	211
EDUCATIONAL	211
BUSINESS OPPORTUNITIES	211
EQUIPMENT	211
(Used or Surplus New)	211
For Sale	211
WANTED	211

• These manufacturers
advertised their products in
the ELECTRICAL PRODUCTS GUIDE

For more complete information, and application data on their lines, refer to the index of Advertisers in the ELECTRICAL PRODUCTS GUIDE . . . the 13th issue of ELECTRICAL CONSTRUCTION AND MAINTENANCE.





I've yet to see **1** panelboard
that can do **3** jobs right
—at the right price!

That's why Square D makes **3**
...and you can get **ALL** of them off-the-shelf
from your Electrical Distributor



JOB #1

Primarily to provide lighting circuits with provision for incidental power circuits. (15 to 50 amperes; 1, 2 and 3 poles; 240 volts)

JOB #2

Primarily to provide power circuits with provision for incidental lighting circuits. (15 to 100 amperes; 1, 2, and 3 poles; 240 volts)

JOB #3

Exclusively to provide power and heavy branch feeders. (30 to 600 amperes; 2 and 3 poles; 250 and 600 volts)

NQO LIGHTING PANELBOARD



New
3-Pole
Breaker



Sequence bussing plus new 3-pole breakers permit power circuits in addition to lighting circuits within bus capacity of 200 amperes maximum

MHP POWER PANELBOARD



Bus capacity to 400 amperes for heavier power circuits, plus provision for balanced lighting circuits

QMB POWER PANELBOARD



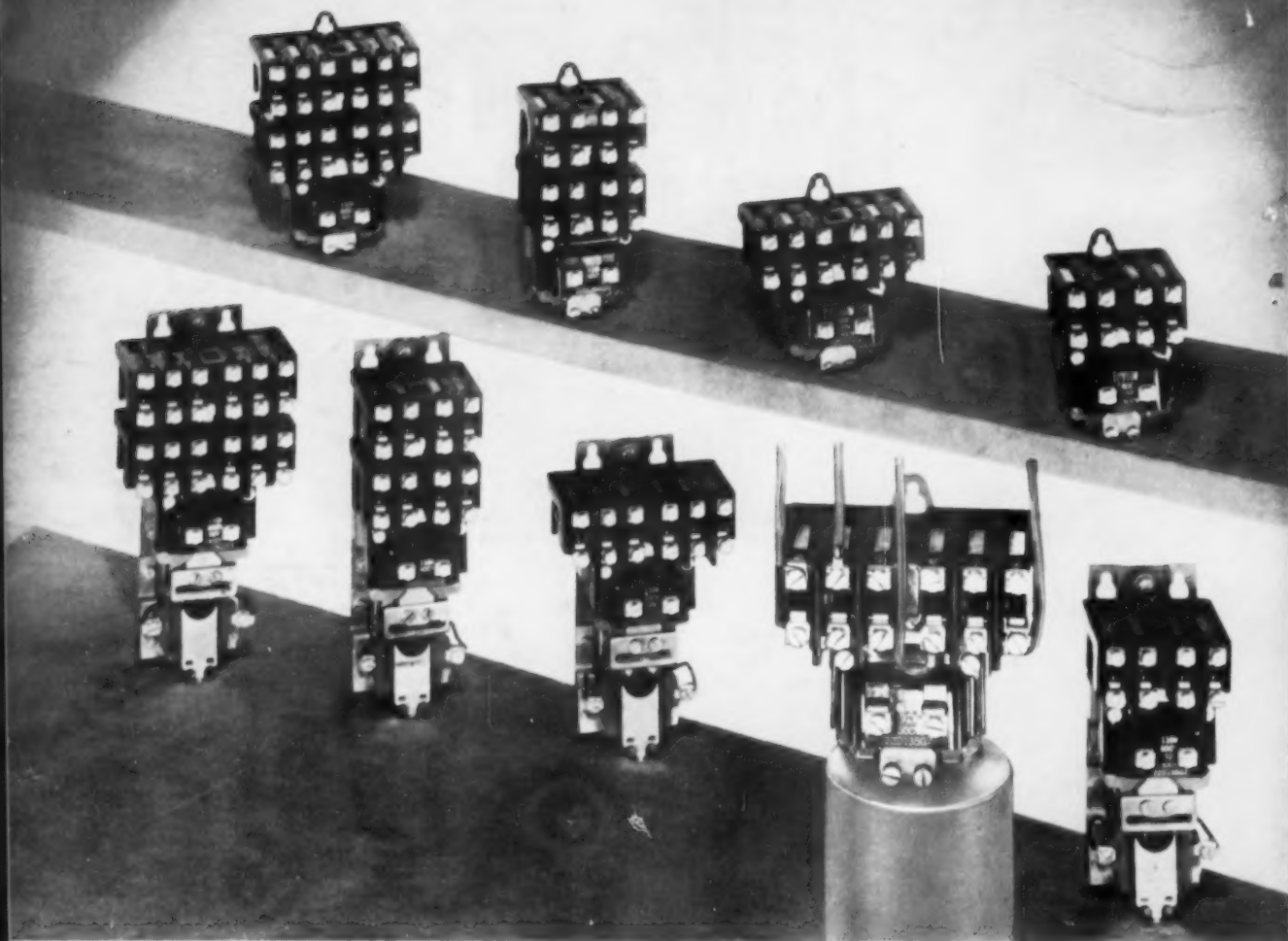
Quick-make, quick-break branches of heavy-duty construction to 600 amperes

With Square D's three U.L. approved lines, there's no need to over-buy or under-buy to get your job done. Write for the complete Panelboard story...
Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan

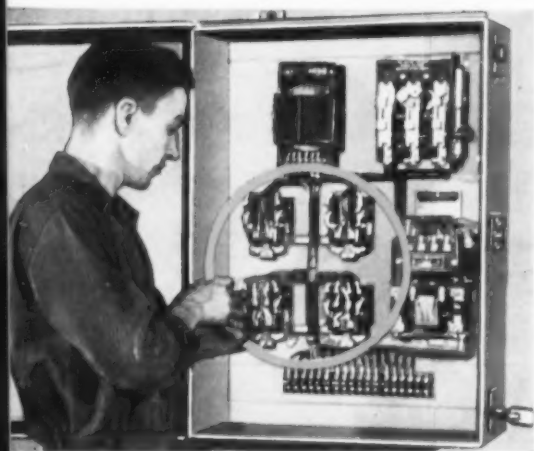
NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE



SQUARE D COMPANY



4-way wiring—clamp-type terminals save wiring time on General Electric machine tool relays



PANEL INSTALLATION is easy with all forms of the machine tool relays. Saddle-clamp terminals can be wired from any of four directions.

Easy installation with General Electric machine tool relays means time saved. Three keyhole slots simplify mounting. In addition, the captive saddle-clamp terminals can be wired from top, bottom, or either side, and are accessible from the front. Also, the new 6-pole-in-line and 12-pole forms have the same mounting dimensions as the 4- and 8-pole forms respectively.

Contacts can be changed from normally open to normally closed without extra parts. The movable contacts have permanently attached springs to maintain proper tip pressure and to prevent loss of springs.

Customer satisfaction results from the long, highly dependable service of G-E machine tool relays. The Strongbox coil is sealed against dust, oil, and moisture for maximum life. Also, your customers will find that maintenance is easy.

A wide range of forms is available. G-E machine tool relays are offered with from 2 through 12 poles, in both standard and latched-in forms. They're rated at 10 amps, 600 volts, 25-60 cycles.

For quick delivery, see your General Electric Distributor. He can also give you complete information, or write for Bulletin GEC-1415 (standard forms) or GEC-1416 (latched-in forms) to Advertising Section 733-25, General Electric Company, Bloomington, Illinois.

GENERAL  ELECTRIC